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Iwai et al.

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(45) **Date of Patent: Sep. 8, 2015**

(54) **INFORMATION PROCESSING DEVICE USING DIRECT DATA ACCESS FROM CLOUD STORAGE**

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(73) Assignee: **KONICA MINOLTA BUSINESS TECHNOLOGIES, INC.**, Chiyoda-Ku, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 197 days.

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**
G06F 3/00 (2006.01)
H04L 12/24 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***H04L 41/22*** (2013.01); ***G06F 3/1204*** (2013.01); ***G06F 3/1253*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H04L 67/36; H04L 67/125; H04L 67/10; G06F 3/1204; G06F 3/1253; G06F 3/1288; G06F 3/1292; G06F 3/1236
USPC 709/227, 229; 718/1; 455/456.2, 422.1
See application file for complete search history.

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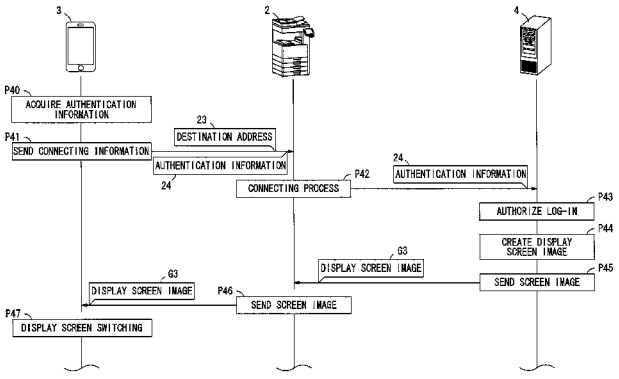
Assistant Examiner — Mandrita Brahmachari
(74) *Attorney, Agent, or Firm* — Buchanan Ingersoll & Rooney PC

(57) **ABSTRACT**

An information processing system comprising a communication terminal and an information processing device that allow communication therebetween. The communication terminal includes: a remote controlling part for acquiring an operation screen image, with which the user makes remote operation of the information processing device; and a cloud service connecting part for connecting to a service providing server providing a cloud service over a network, and acquiring a display screen image for using the cloud service from the service providing server in response to user's instruction, thereby causing the acquired display screen image to be displayed on the display part together with the operation screen image. The remote controlling part sends connecting information for connecting to the service providing server to the information processing device. The remote controlling part switches the display screen image displayed by the cloud service connecting part to the display screen image acquired by the information processing device.

32 Claims, 20 Drawing Sheets



(51) **Int. Cl.**

H04L 29/08	(2006.01)
G06F 3/12	(2006.01)
H04N 1/00	(2006.01)

(52) **U.S. Cl.**

CPC ***G06F 3/1288*** (2013.01); ***G06F 3/1292*** (2013.01); ***H04L 67/10*** (2013.01); ***H04L 67/125*** (2013.01); ***H04L 67/36*** (2013.01); ***H04N 1/00344*** (2013.01); ***H04N 1/00503*** (2013.01); *G06F 3/1236* (2013.01); *H04N 2201/0036* (2013.01); *H04N 2201/0075* (2013.01)

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FIG. 1

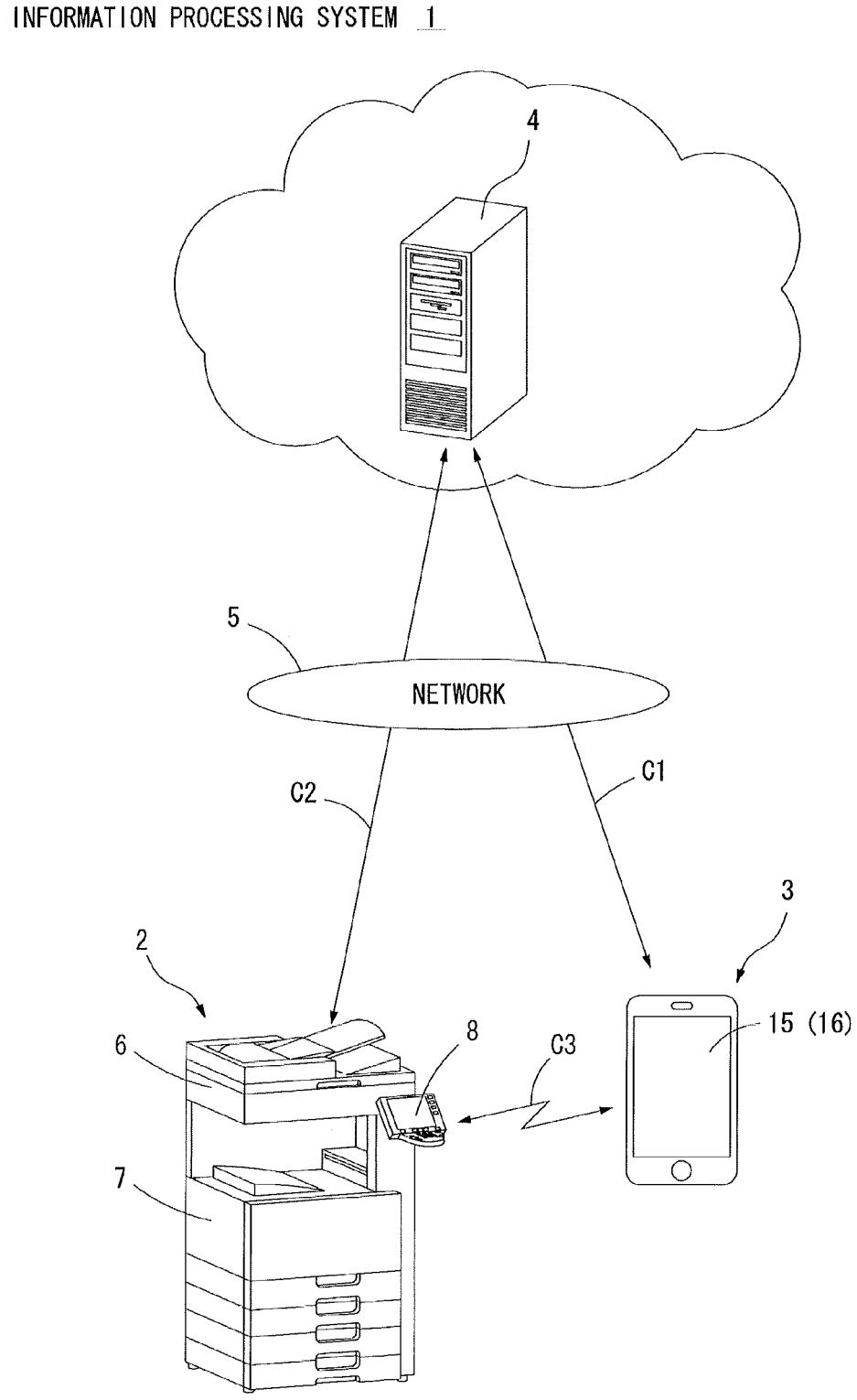

INFORMATION PROCESSING SYSTEM 1
4
5
NETWORK
C2
C1
3
2
6
8
C3
15 (16)
7

FIG. 2

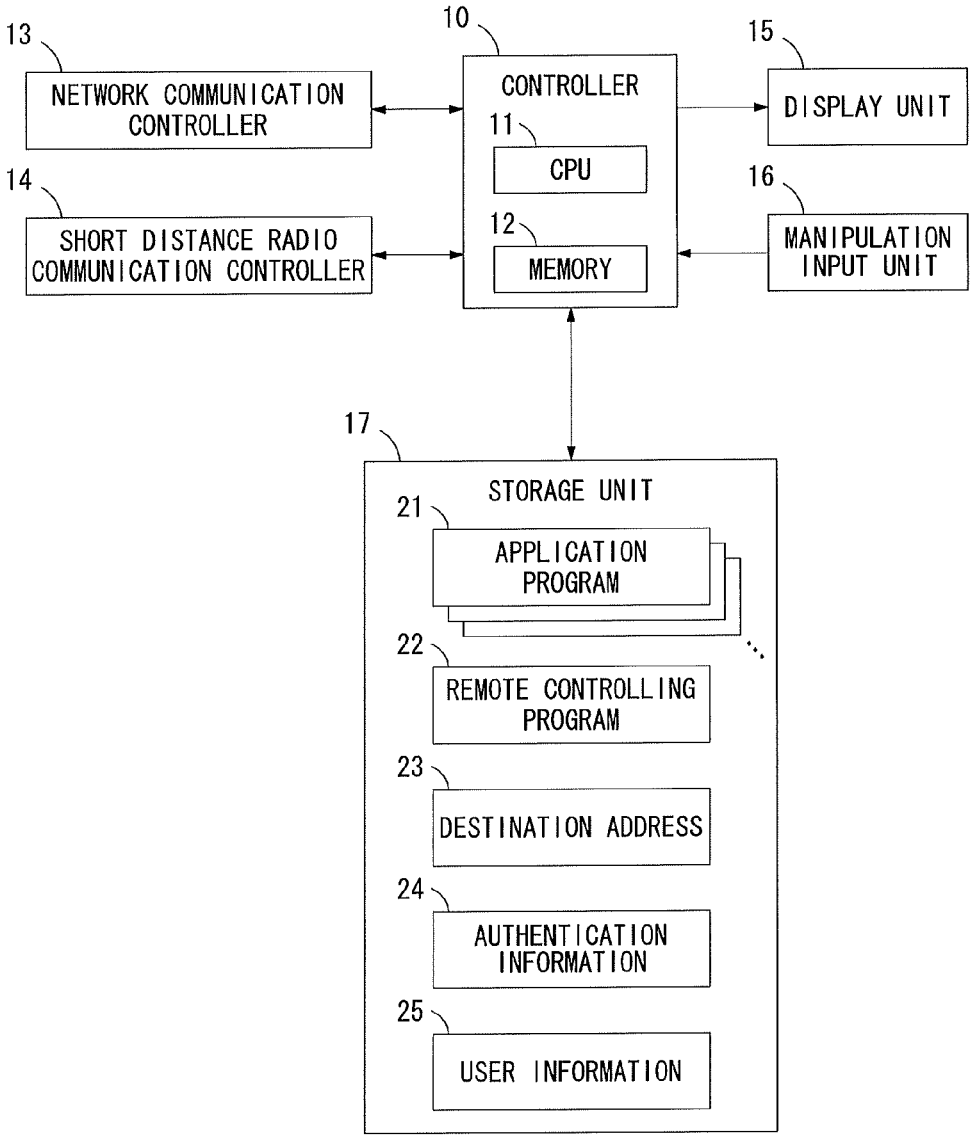

COMMUNICATION TERMINAL 3
13
NETWORK COMMUNICATION CONTROLLER
14
SHORT DISTANCE RADIO COMMUNICATION CONTROLLER
10
CONTROLLER
11
CPU
12
MEMORY
15
DISPLAY UNIT
16
MANIPULATION INPUT UNIT
17
STORAGE UNIT
21
APPLICATION PROGRAM
22
REMOTE CONTROLLING PROGRAM
23
DESTINATION ADDRESS
24
AUTHENTICATION INFORMATION
25
USER INFORMATION

FIG. 3

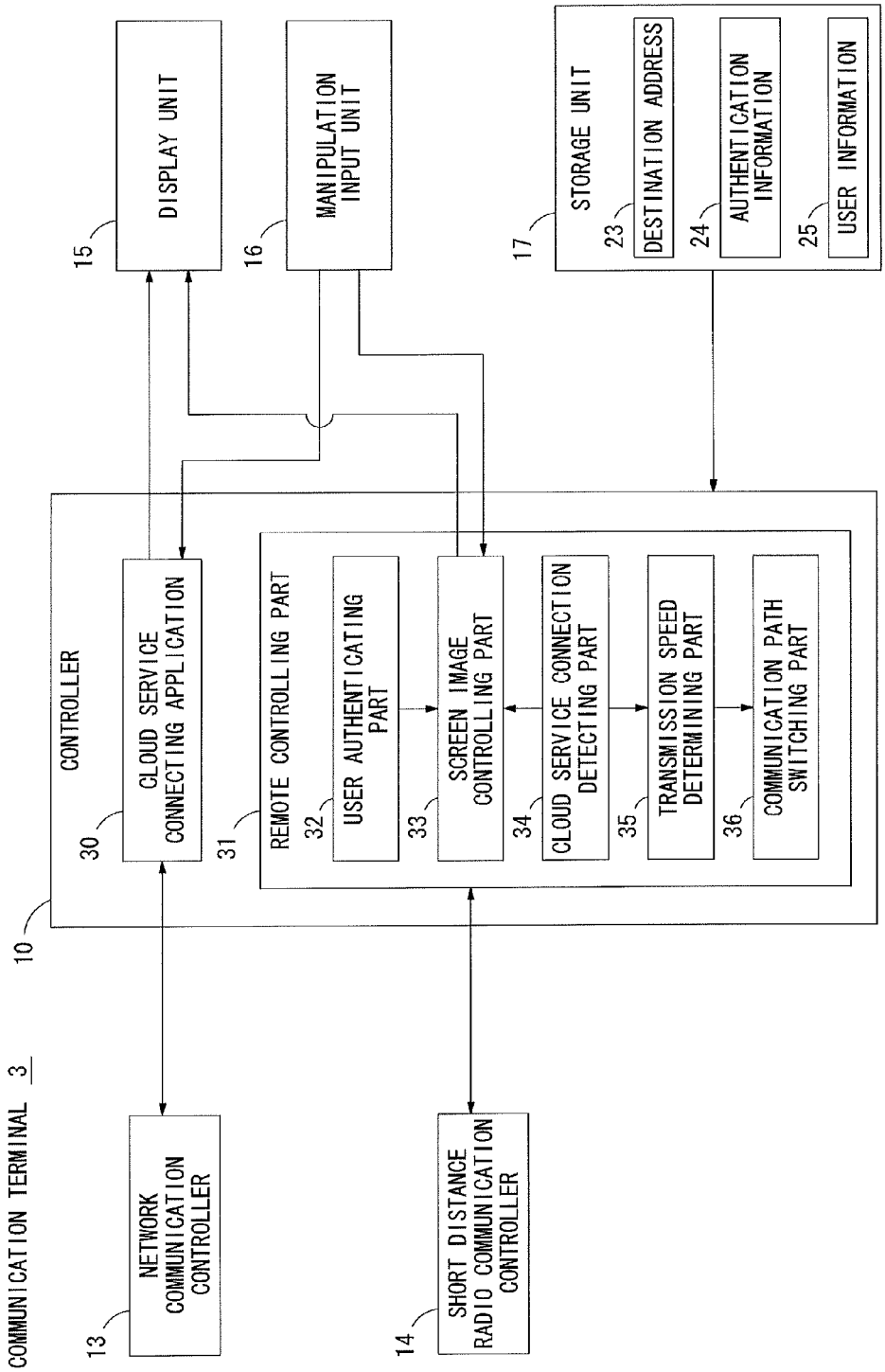

COMMUNICATION TERMINAL 3
10
CONTROLLER
30
CLOUD SERVICE CONNECTING APPLICATION
31
REMOTE CONTROLLING PART
32
USER AUTHENTICATING PART
33
SCREEN IMAGE CONTROLLING PART
34
CLOUD SERVICE CONNECTION DETECTING PART
35
TRANSMISSION SPEED DETERMINING PART
36
COMMUNICATION PATH SWITCHING PART
13
NETWORK COMMUNICATION CONTROLLER
14
SHORT DISTANCE RADIO COMMUNICATION CONTROLLER
15
DISPLAY UNIT
16
MANIPULATION INPUT UNIT
17
STORAGE UNIT
23
DESTINATION ADDRESS
24
AUTHENTICATION INFORMATION
25
USER INFORMATION

FIG. 4

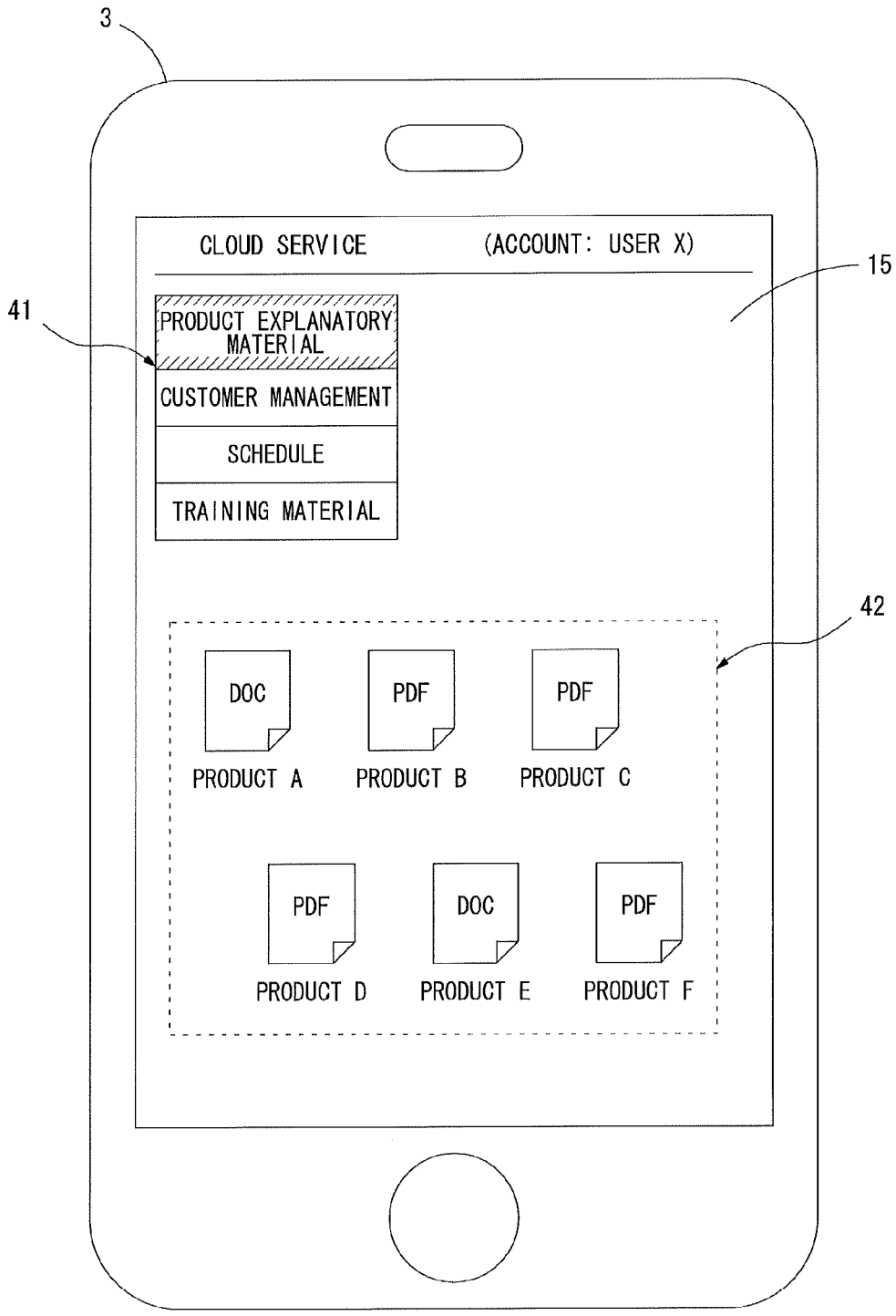

3
CLOUD SERVICE
(ACCOUNT: USER X)
15
41
PRODUCT EXPLANATORY MATERIAL
CUSTOMER MANAGEMENT
SCHEDULE
TRAINING MATERIAL
42
DOC
PDF
PDF
PRODUCT A
PRODUCT B
PRODUCT C
PDF
DOC
PDF
PRODUCT D
PRODUCT E
PRODUCT F

FIG. 5

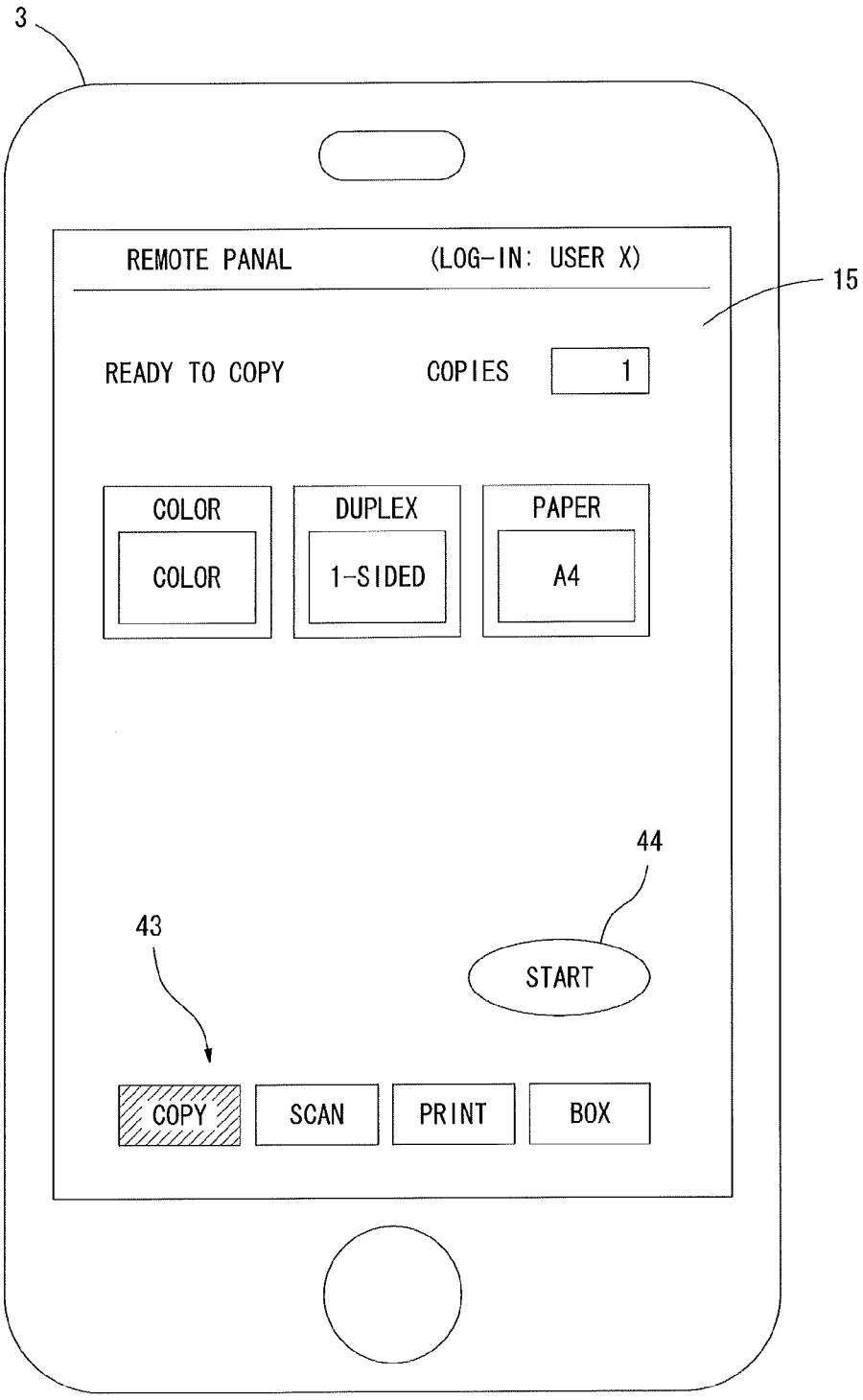

3
REMOTE PANAL
(LOG-IN: USER X)
15
READY TO COPY
COPIES
1
COLOR
COLOR
DUPLEX
1-SIDED
PAPER
A4
44
43
START
COPY
SCAN
PRINT
BOX

FIG. 6

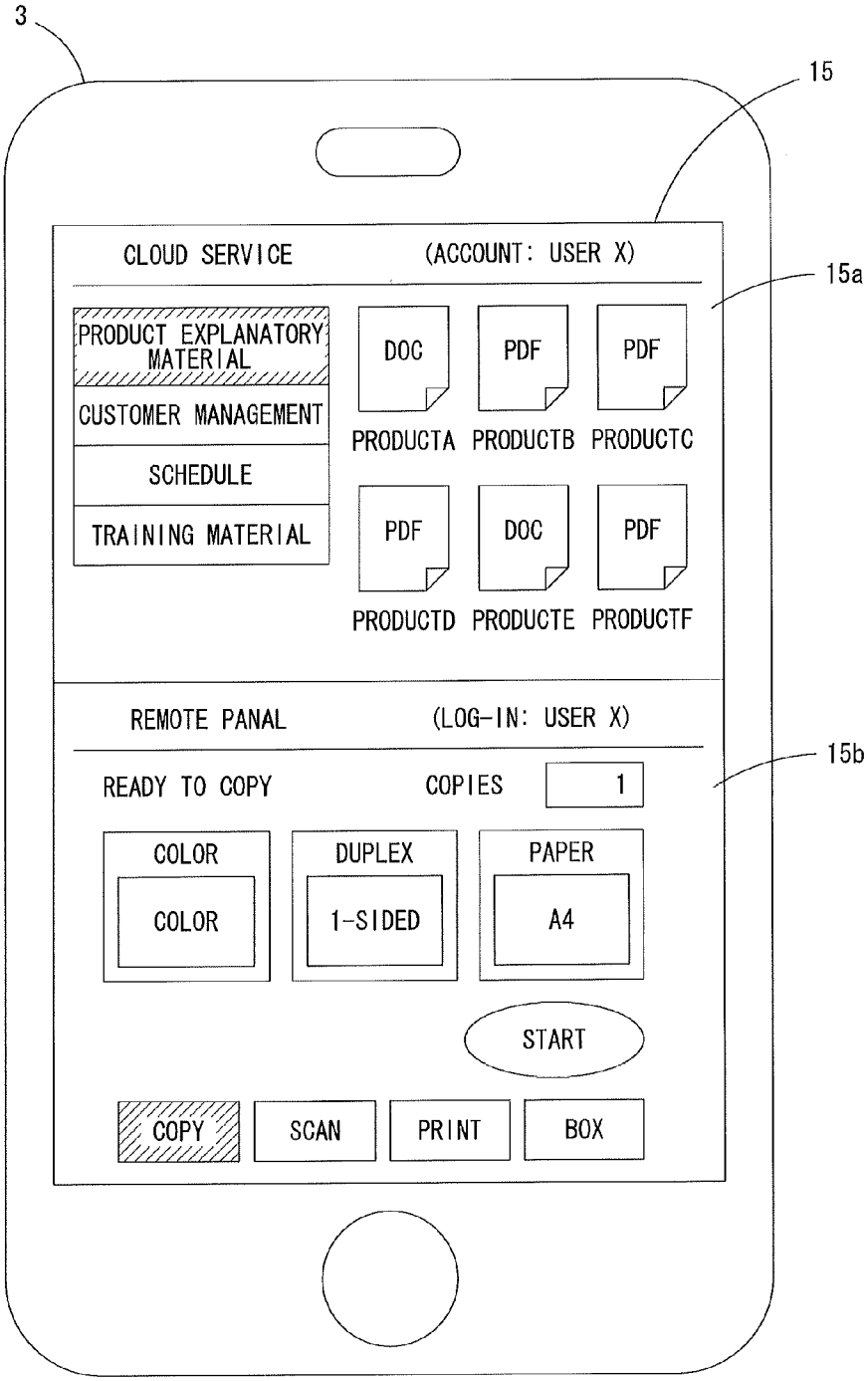

3
15
CLOUD SERVICE
(ACCOUNT: USER X)
15a
PRODUCT EXPLANATORY MATERIAL
CUSTOMER MANAGEMENT
SCHEDULE
TRAINING MATERIAL
DOC
PDF
PDF
PRODUCTA
PRODUCTB
PRODUCTC
PDF
DOC
PDF
PRODUCTD
PRODUCTE
PRODUCTF
REMOTE PANAL
(LOG-IN: USER X)
15b
READY TO COPY
COPIES
1
COLOR
COLOR
DUPLEX
1-SIDED
PAPER
A4
START
COPY
SCAN
PRINT
BOX

FIG. 7

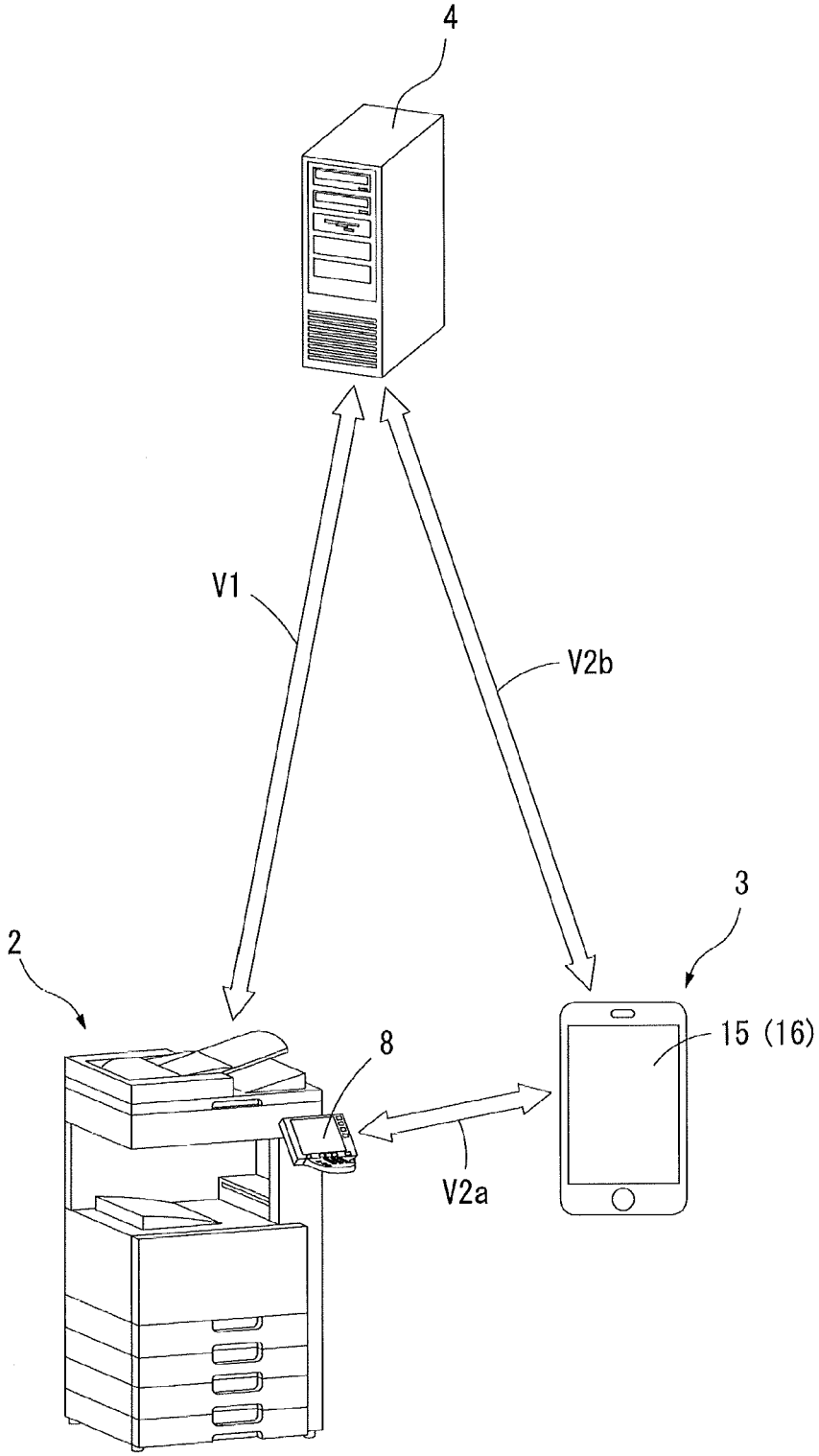


FIG. 8

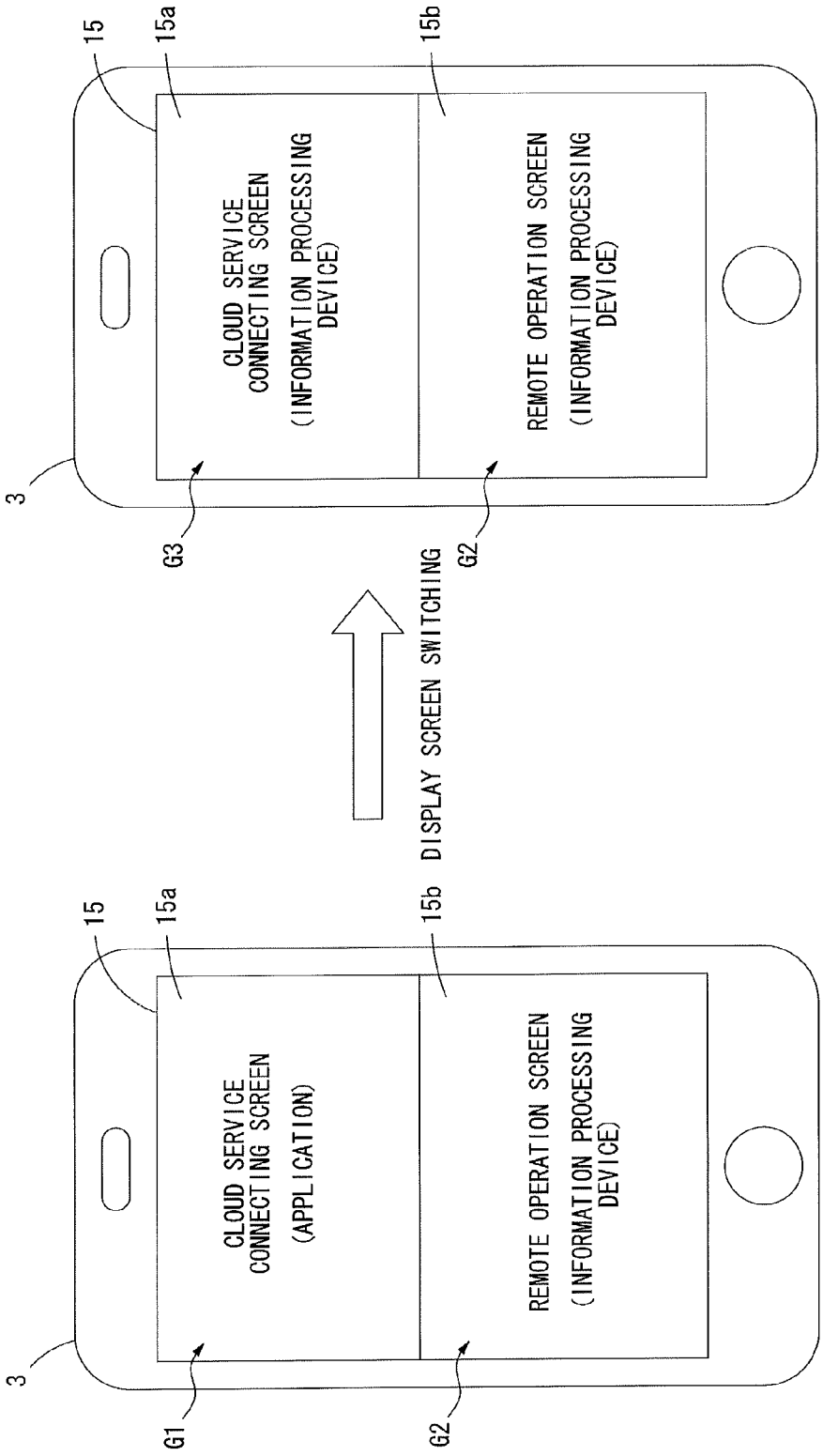

15
15a
15b
CLOUD SERVICE CONNECTING SCREEN (APPLICATION)
REMOTE OPERATION SCREEN (INFORMATION PROCESSING DEVICE)
3
G1
G2
DISPLAY SCREEN SWITCHING
15
15a
15b
CLOUD SERVICE CONNECTING SCREEN (INFORMATION PROCESSING DEVICE)
REMOTE OPERATION SCREEN (INFORMATION PROCESSING DEVICE)
3
G3
G2

FIG. 9

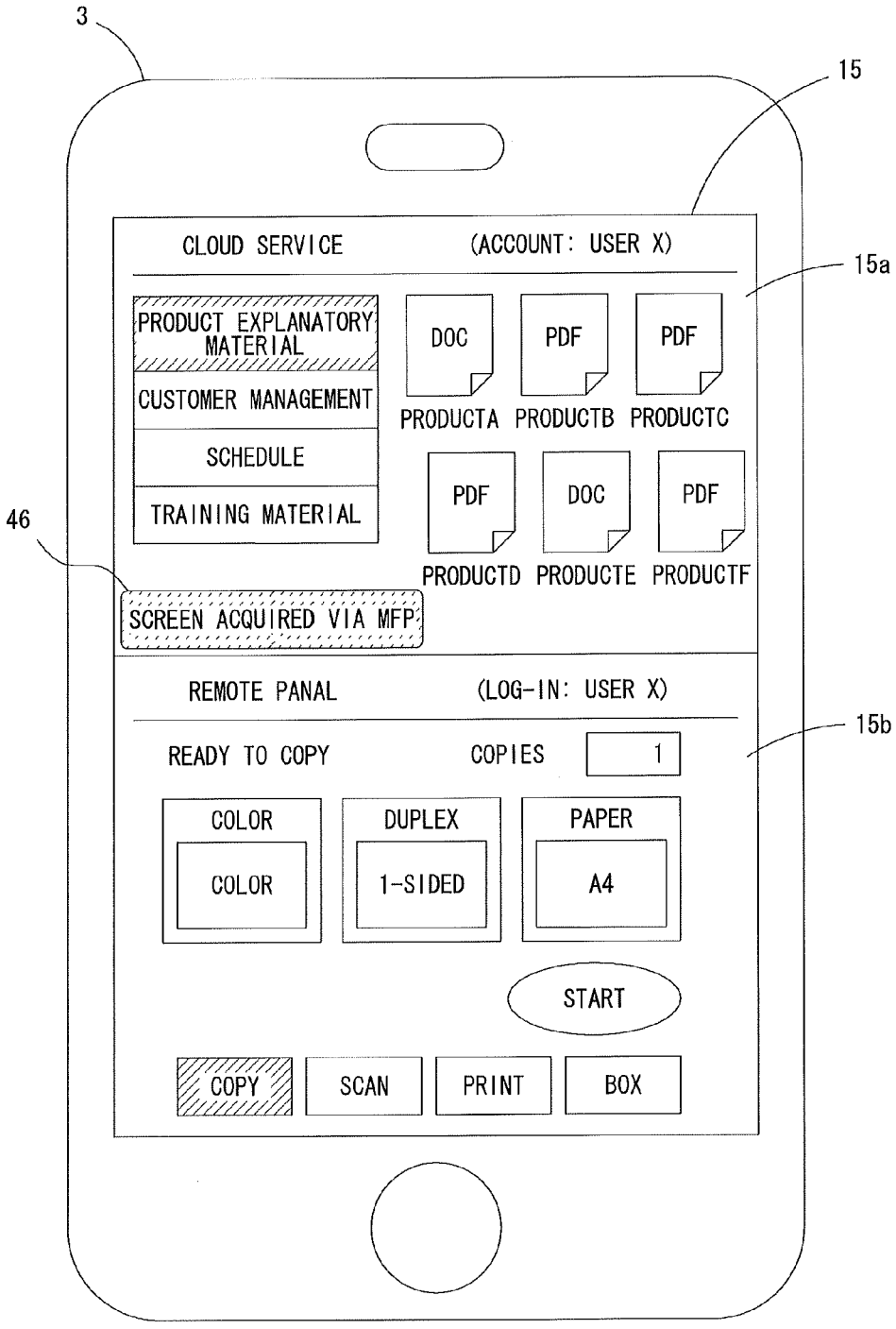

3
15
CLOUD SERVICE
(ACCOUNT: USER X)
15a
PRODUCT EXPLANATORY MATERIAL
CUSTOMER MANAGEMENT
SCHEDULE
TRAINING MATERIAL
DOC
PDF
PDF
PRODUCTA
PRODUCTB
PRODUCTC
PDF
DOC
PDF
PRODUCTD
PRODUCTE
PRODUCTF
46
SCREEN ACQUIRED VIA MFP
REMOTE PANAL
(LOG-IN: USER X)
15b
READY TO COPY
COPIES
1
COLOR
COLOR
DUPLEX
1-SIDED
PAPER
A4
START
COPY
SCAN
PRINT
BOX

FIG. 10

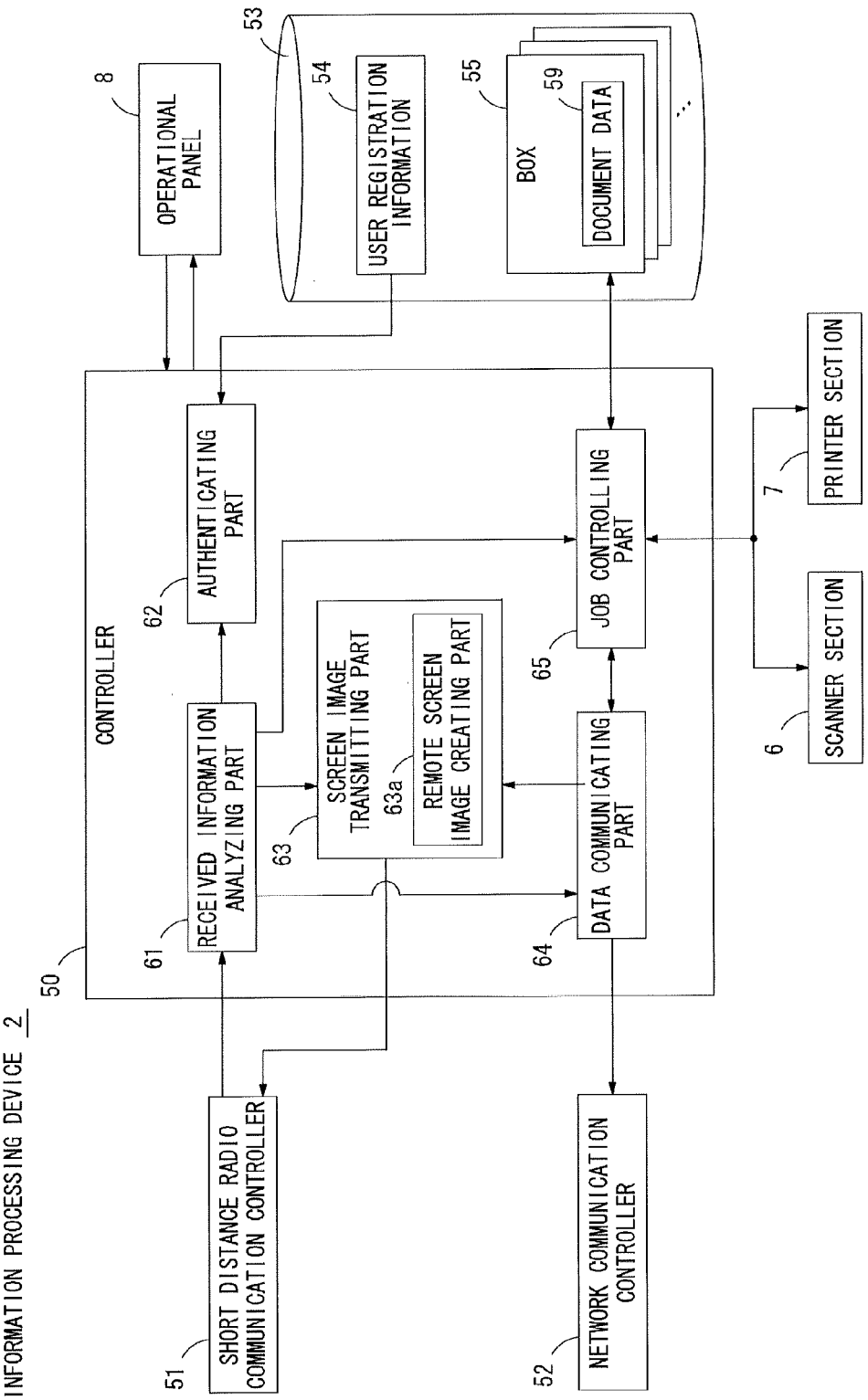

INFORMATION PROCESSING DEVICE 2
CONTROLLER
50
OPERATIONAL PANEL
8
53
54
USER REGISTRATION INFORMATION
55
BOX
59
DOCUMENT DATA
AUTHENTICATING PART
62
RECEIVED INFORMATION ANALYZING PART
61
SCREEN IMAGE TRANSMITTING PART
63
63a
REMOTE SCREEN IMAGE CREATING PART
JOB CONTROLLING PART
65
DATA COMMUNICATING PART
64
SHORT DISTANCE RADIO COMMUNICATION CONTROLLER
51
NETWORK COMMUNICATION CONTROLLER
52
PRINTER SECTION
7
SCANNER SECTION
6

FIG. 11

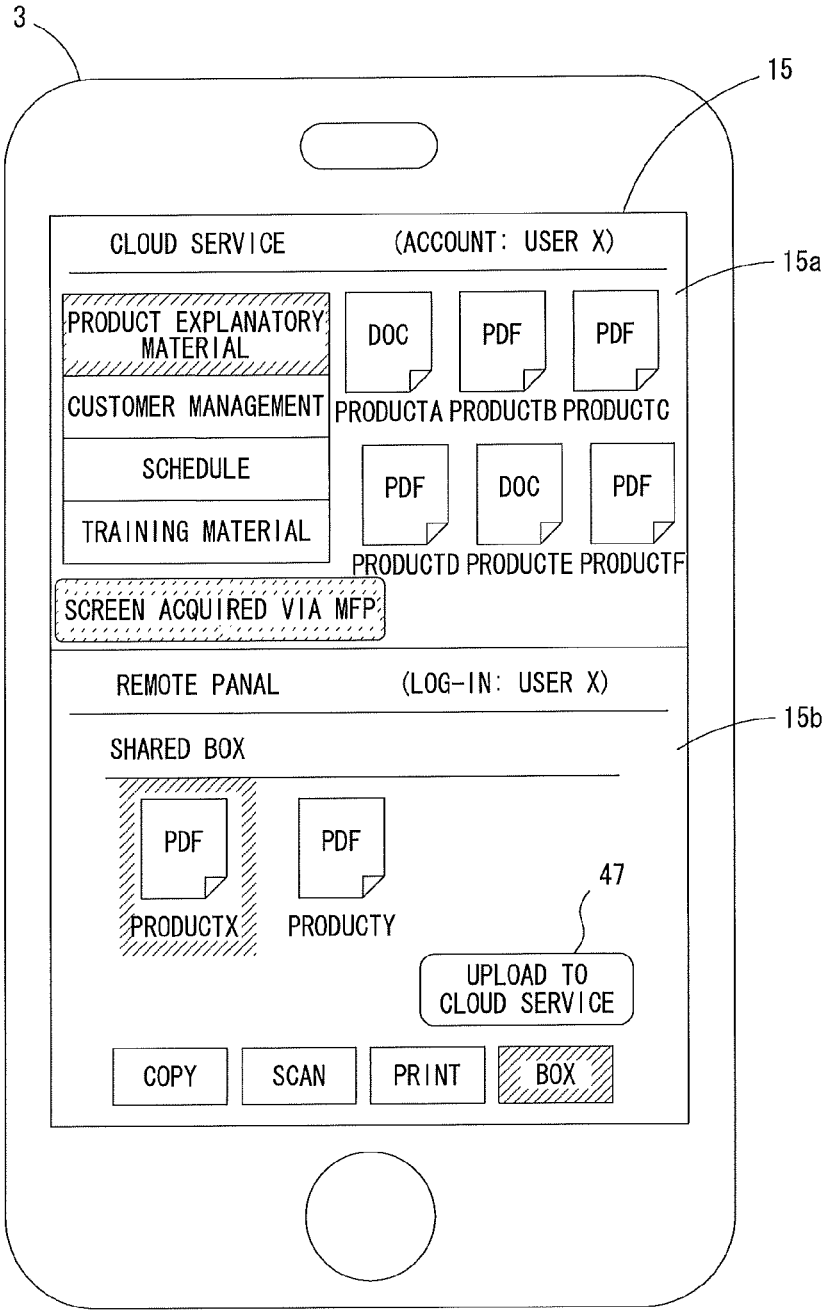

3
15
CLOUD SERVICE
(ACCOUNT: USER X)
15a
PRODUCT EXPLANATORY MATERIAL
CUSTOMER MANAGEMENT
SCHEDULE
TRAINING MATERIAL
DOC
PDF
PDF
PRODUCTA
PRODUCTB
PRODUCTC
PDF
DOC
PDF
PRODUCTD
PRODUCTE
PRODUCTF
SCREEN ACQUIRED VIA MFP
REMOTE PANAL
(LOG-IN: USER X)
15b
SHARED BOX
PDF
PRODUCTX
PDF
PRODUCTY
47
UPLOAD TO CLOUD SERVICE
COPY
SCAN
PRINT
BOX

FIG. 12

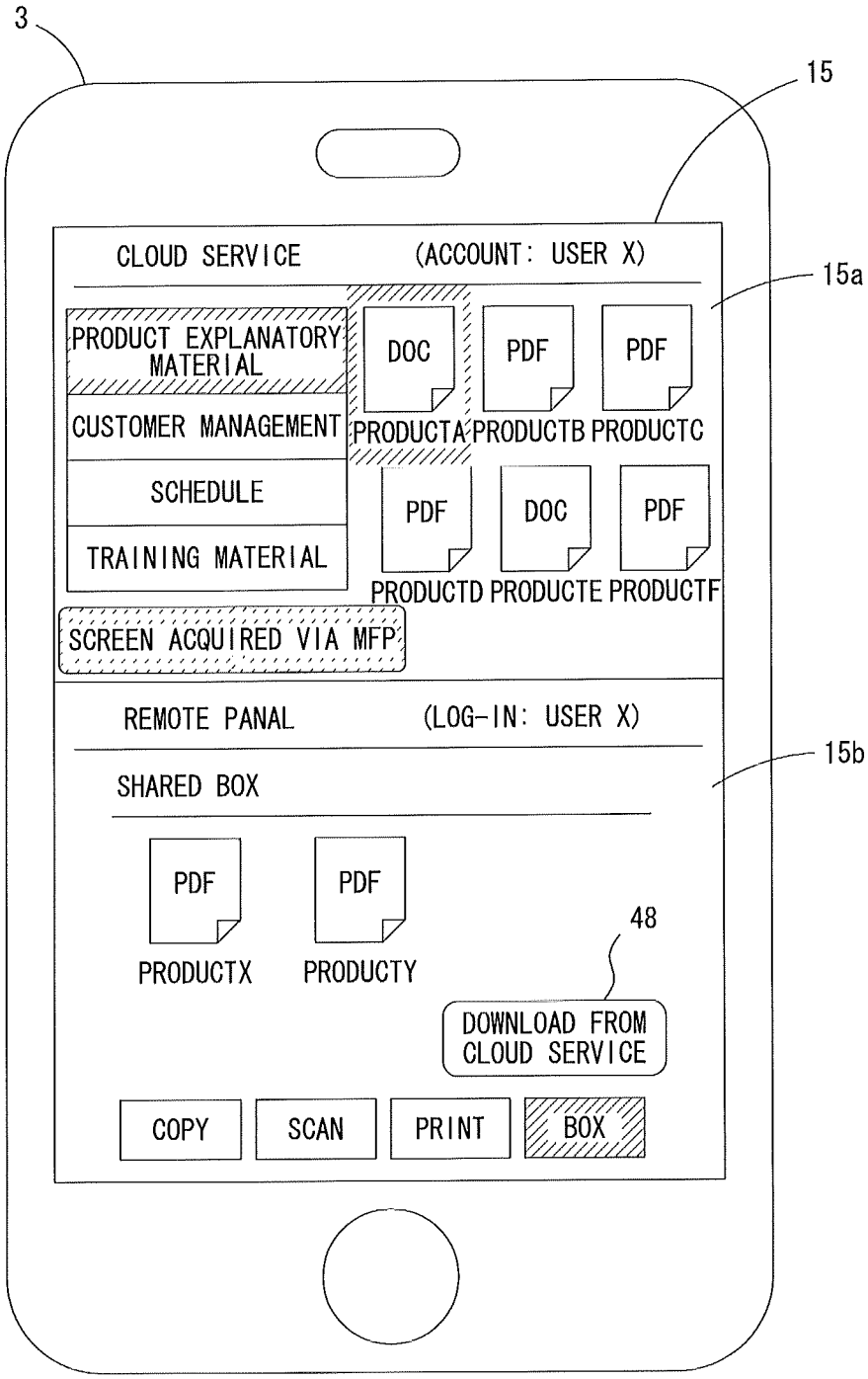

3
15
CLOUD SERVICE
(ACCOUNT: USER X)
15a
PRODUCT EXPLANATORY MATERIAL
CUSTOMER MANAGEMENT
SCHEDULE
TRAINING MATERIAL
DOC
PDF
PDF
PRODUCTA
PRODUCTB
PRODUCTC
PDF
DOC
PDF
PRODUCTD
PRODUCTE
PRODUCTF
SCREEN ACQUIRED VIA MFP
REMOTE PANAL
(LOG-IN: USER X)
15b
SHARED BOX
PDF
PDF
PRODUCTX
PRODUCTY
48
DOWNLOAD FROM CLOUD SERVICE
COPY
SCAN
PRINT
BOX

FIG. 13

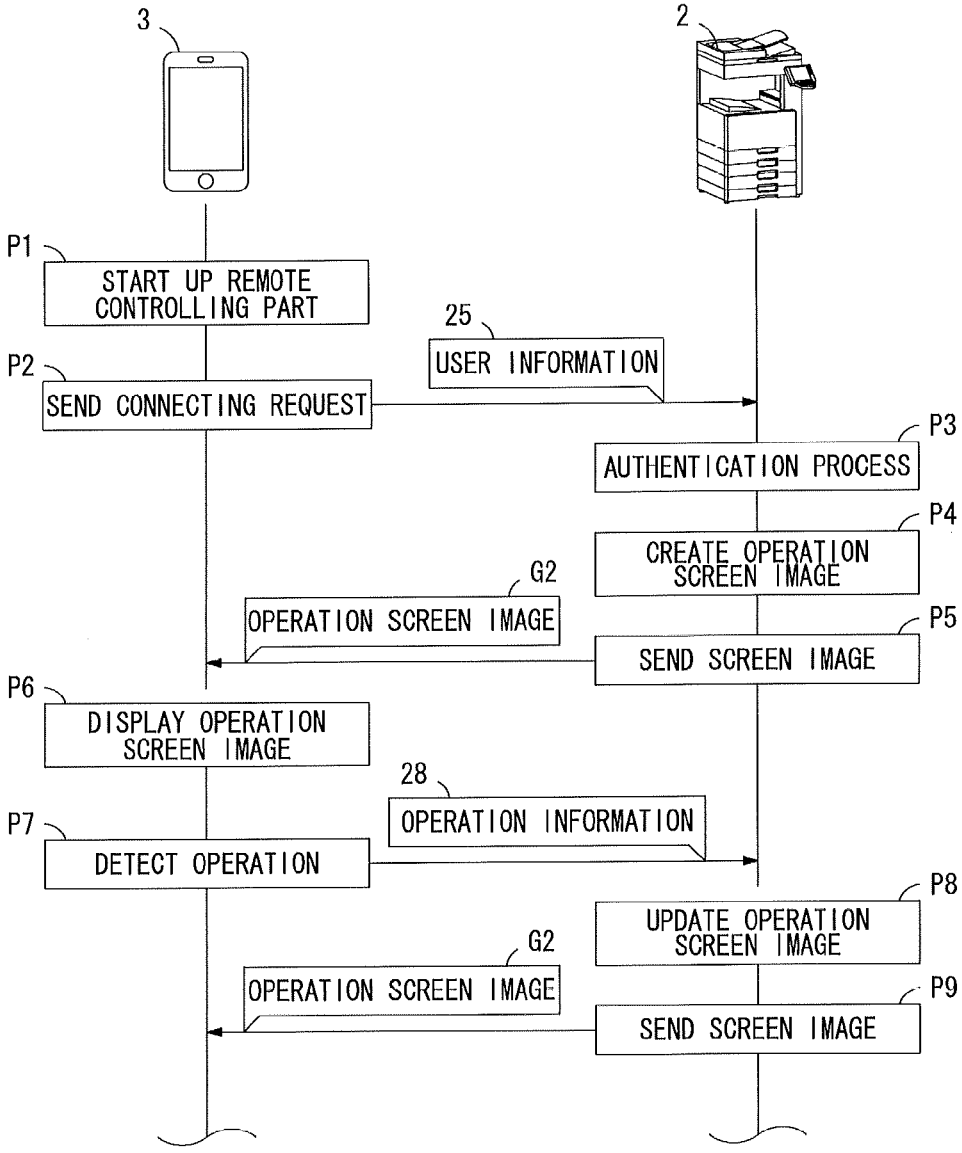

3
2
P1
START UP REMOTE CONTROLLING PART
25
USER INFORMATION
P2
SEND CONNECTING REQUEST
P3
AUTHENTICATION PROCESS
P4
CREATE OPERATION SCREEN IMAGE
G2
OPERATION SCREEN IMAGE
P5
SEND SCREEN IMAGE
P6
DISPLAY OPERATION SCREEN IMAGE
28
OPERATION INFORMATION
P7
DETECT OPERATION
P8
UPDATE OPERATION SCREEN IMAGE
G2
OPERATION SCREEN IMAGE
P9
SEND SCREEN IMAGE

FIG. 14

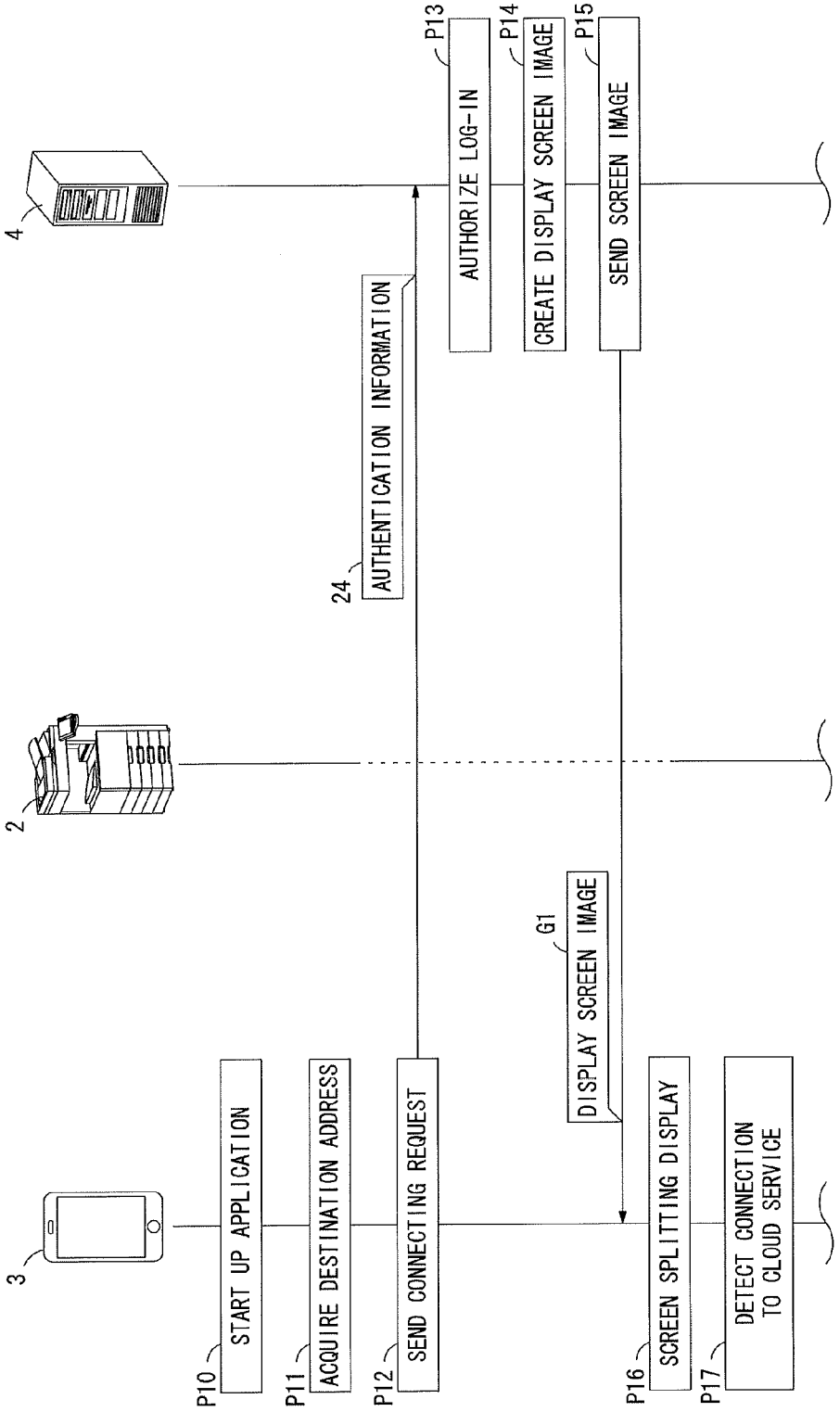

3
4
2
P10
START UP APPLICATION
P11
ACQUIRE DESTINATION ADDRESS
P12
SEND CONNECTING REQUEST
24
AUTHENTICATION INFORMATION
P13
AUTHORIZE LOG-IN
P14
CREATE DISPLAY SCREEN IMAGE
P15
SEND SCREEN IMAGE
G1
DISPLAY SCREEN IMAGE
P16
SCREEN SPLITTING DISPLAY
P17
DETECT CONNECTION TO CLOUD SERVICE

FIG. 15

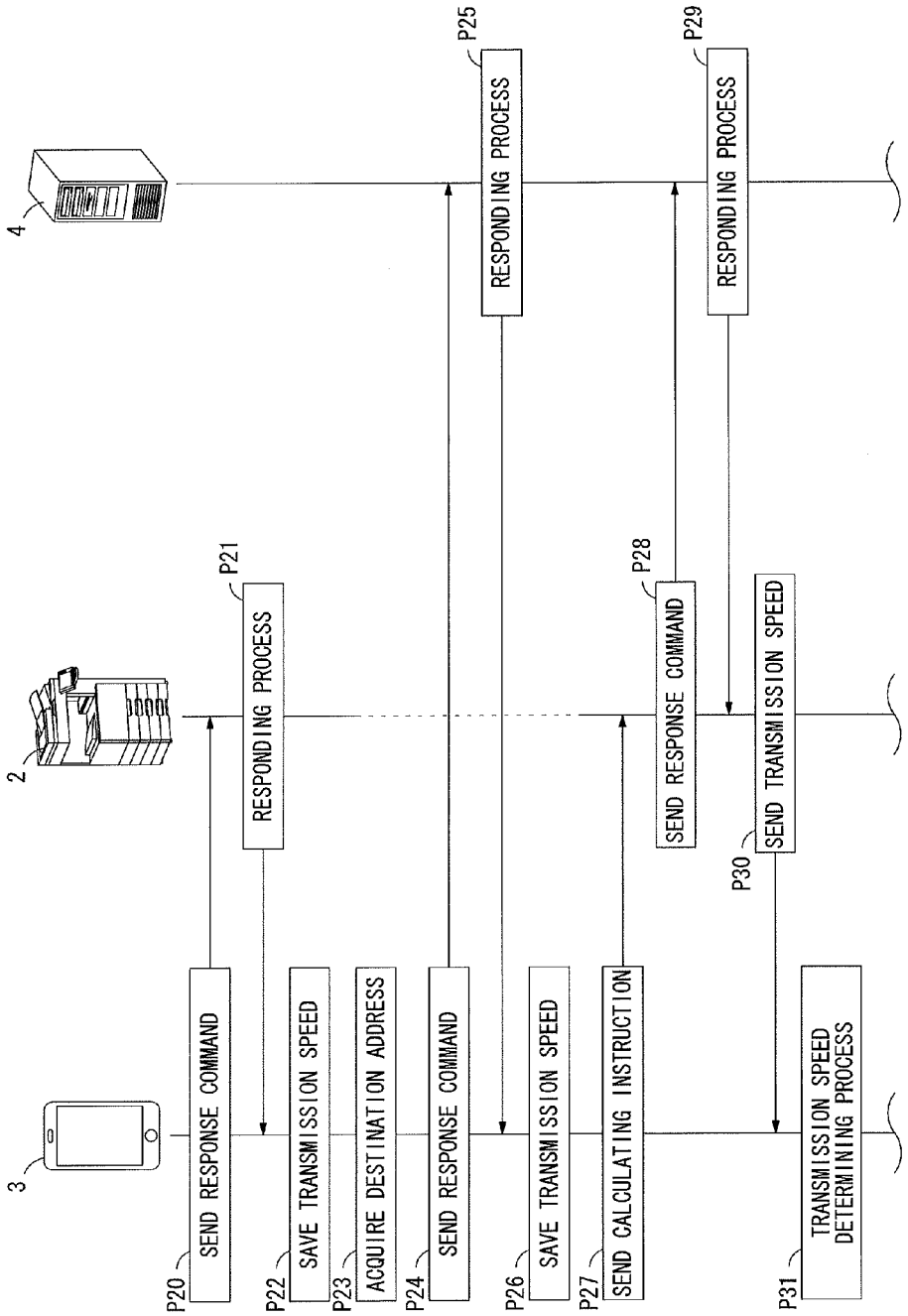

3
2
4
P20
SEND RESPONSE COMMAND
P21
RESPONDING PROCESS
P22
SAVE TRANSMISSION SPEED
P23
ACQUIRE DESTINATION ADDRESS
P24
SEND RESPONSE COMMAND
P25
RESPONDING PROCESS
P26
SAVE TRANSMISSION SPEED
P27
SEND CALCULATING INSTRUCTION
P28
SEND RESPONSE COMMAND
P29
RESPONDING PROCESS
P30
SEND TRANSMISSION SPEED
P31
TRANSMISSION SPEED DETERMINING PROCESS

FIG. 16

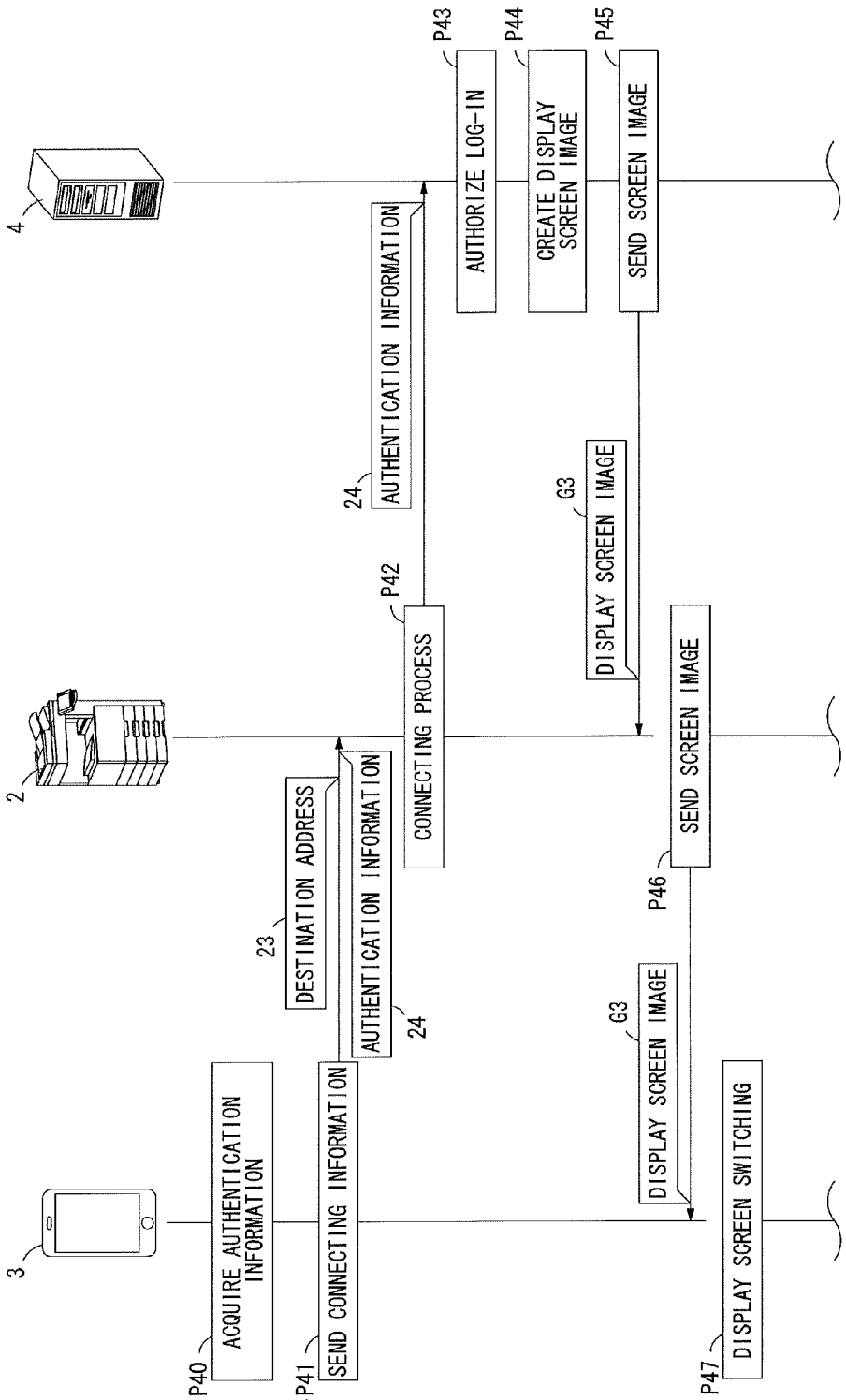

3
4
2
P40
ACQUIRE AUTHENTICATION INFORMATION
P41
SEND CONNECTING INFORMATION
23
DESTINATION ADDRESS
24
AUTHENTICATION INFORMATION
P42
CONNECTING PROCESS
24
AUTHENTICATION INFORMATION
P43
AUTHORIZE LOG-IN
P44
CREATE DISPLAY SCREEN IMAGE
P45
SEND SCREEN IMAGE
G3
DISPLAY SCREEN IMAGE
P46
SEND SCREEN IMAGE
G3
DISPLAY SCREEN IMAGE
P47
DISPLAY SCREEN SWITCHING

FIG. 17

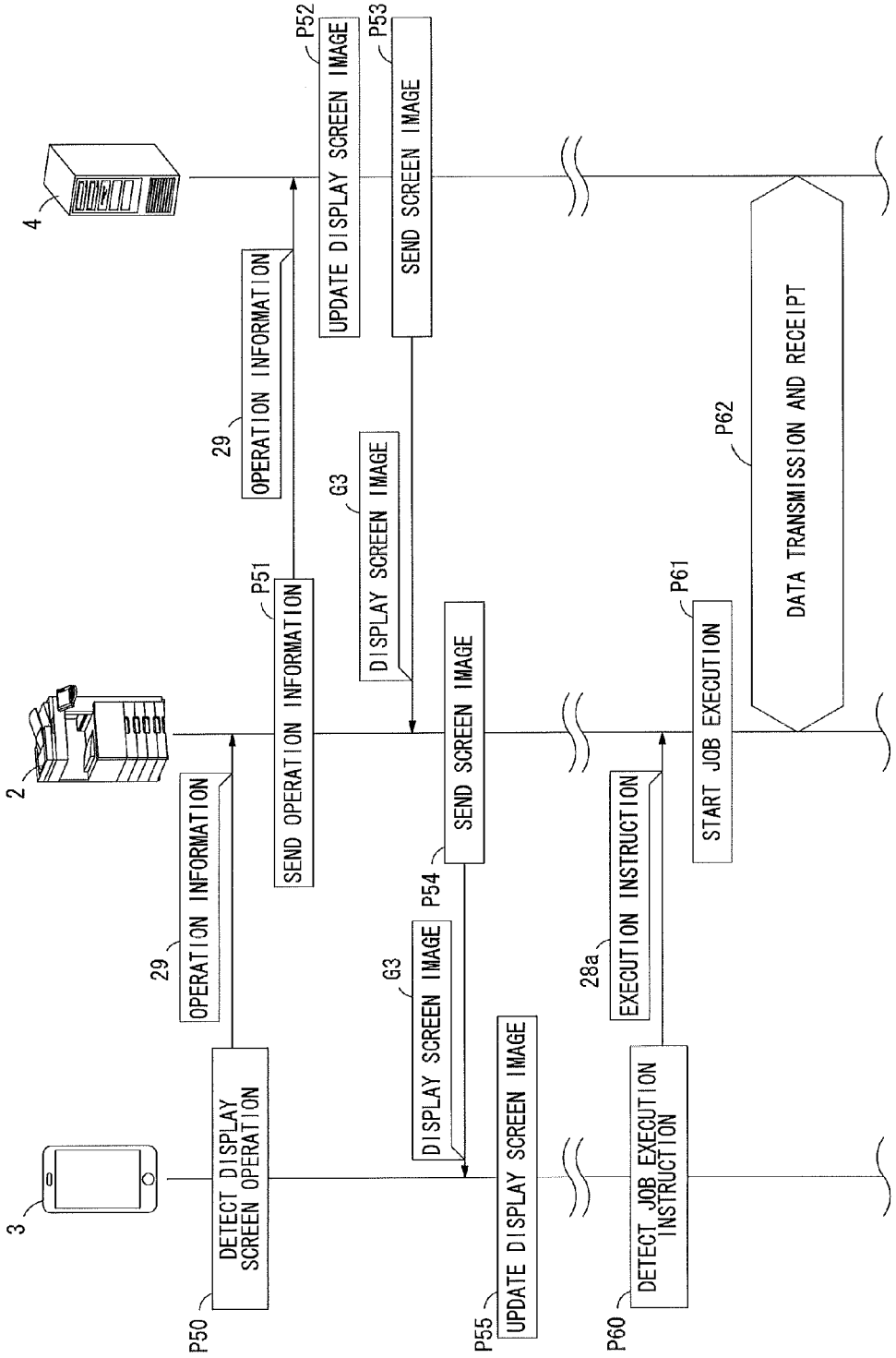

3
2
4
DETECT DISPLAY SCREEN OPERATION
P50
29
OPERATION INFORMATION
SEND OPERATION INFORMATION
P51
29
OPERATION INFORMATION
UPDATE DISPLAY SCREEN IMAGE
P52
G3
DISPLAY SCREEN IMAGE
SEND SCREEN IMAGE
P53
G3
DISPLAY SCREEN IMAGE
SEND SCREEN IMAGE
P54
UPDATE DISPLAY SCREEN IMAGE
P55
28a
EXECUTION INSTRUCTION
DETECT JOB EXECUTION INSTRUCTION
P60
START JOB EXECUTION
P61
DATA TRANSMISSION AND RECEIPT
P62

FIG. 18

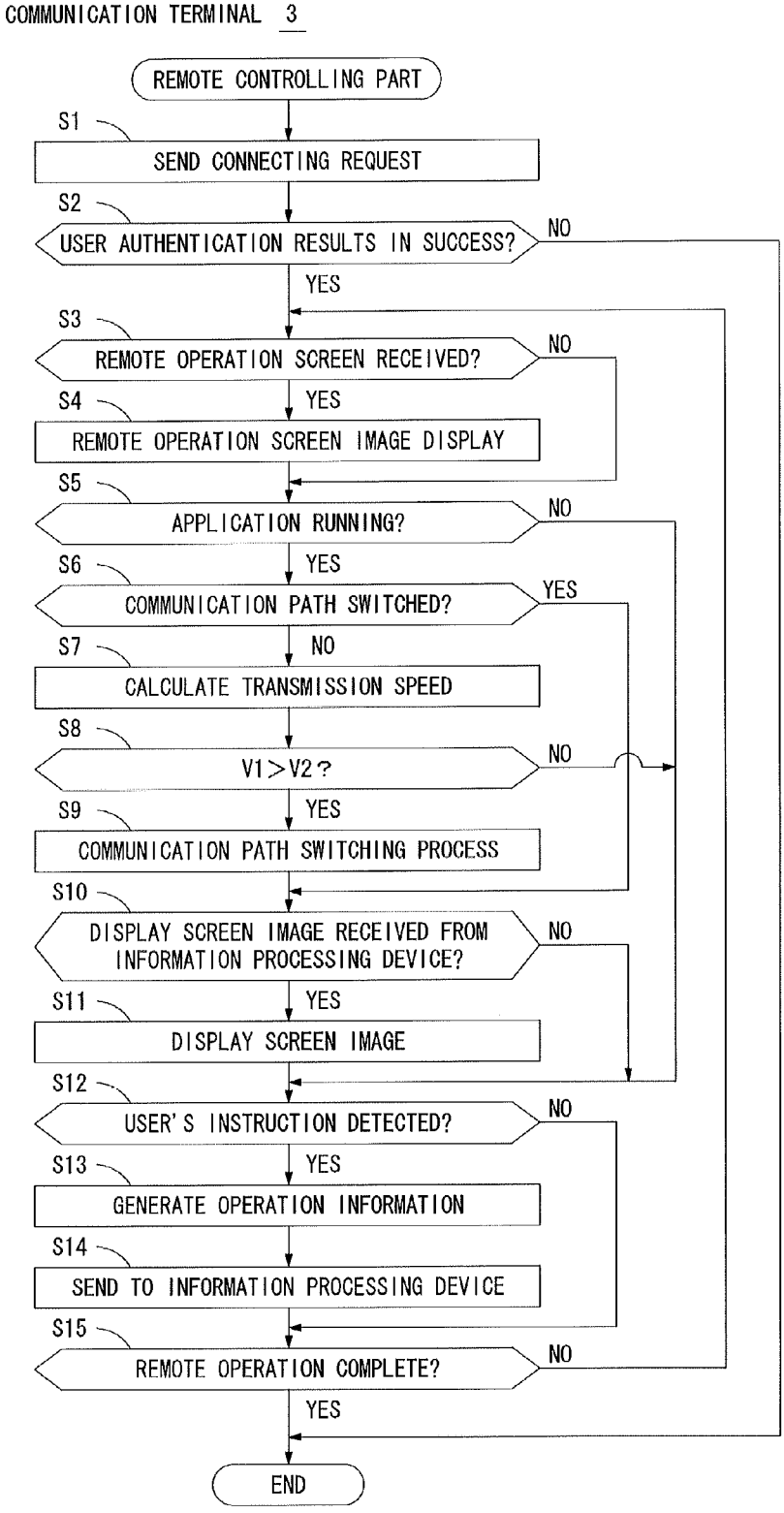

COMMUNICATION TERMINAL 3
REMOTE CONTROLLING PART
S1
SEND CONNECTING REQUEST
S2
USER AUTHENTICATION RESULTS IN SUCCESS?
NO
YES
S3
REMOTE OPERATION SCREEN RECEIVED?
NO
YES
S4
REMOTE OPERATION SCREEN IMAGE DISPLAY
S5
APPLICATION RUNNING?
NO
YES
S6
COMMUNICATION PATH SWITCHED?
YES
NO
S7
CALCULATE TRANSMISSION SPEED
S8
V1>V2?
NO
YES
S9
COMMUNICATION PATH SWITCHING PROCESS
S10
DISPLAY SCREEN IMAGE RECEIVED FROM INFORMATION PROCESSING DEVICE?
NO
YES
S11
DISPLAY SCREEN IMAGE
S12
USER'S INSTRUCTION DETECTED?
NO
YES
S13
GENERATE OPERATION INFORMATION
S14
SEND TO INFORMATION PROCESSING DEVICE
S15
REMOTE OPERATION COMPLETE?
NO
YES
END

FIG. 19

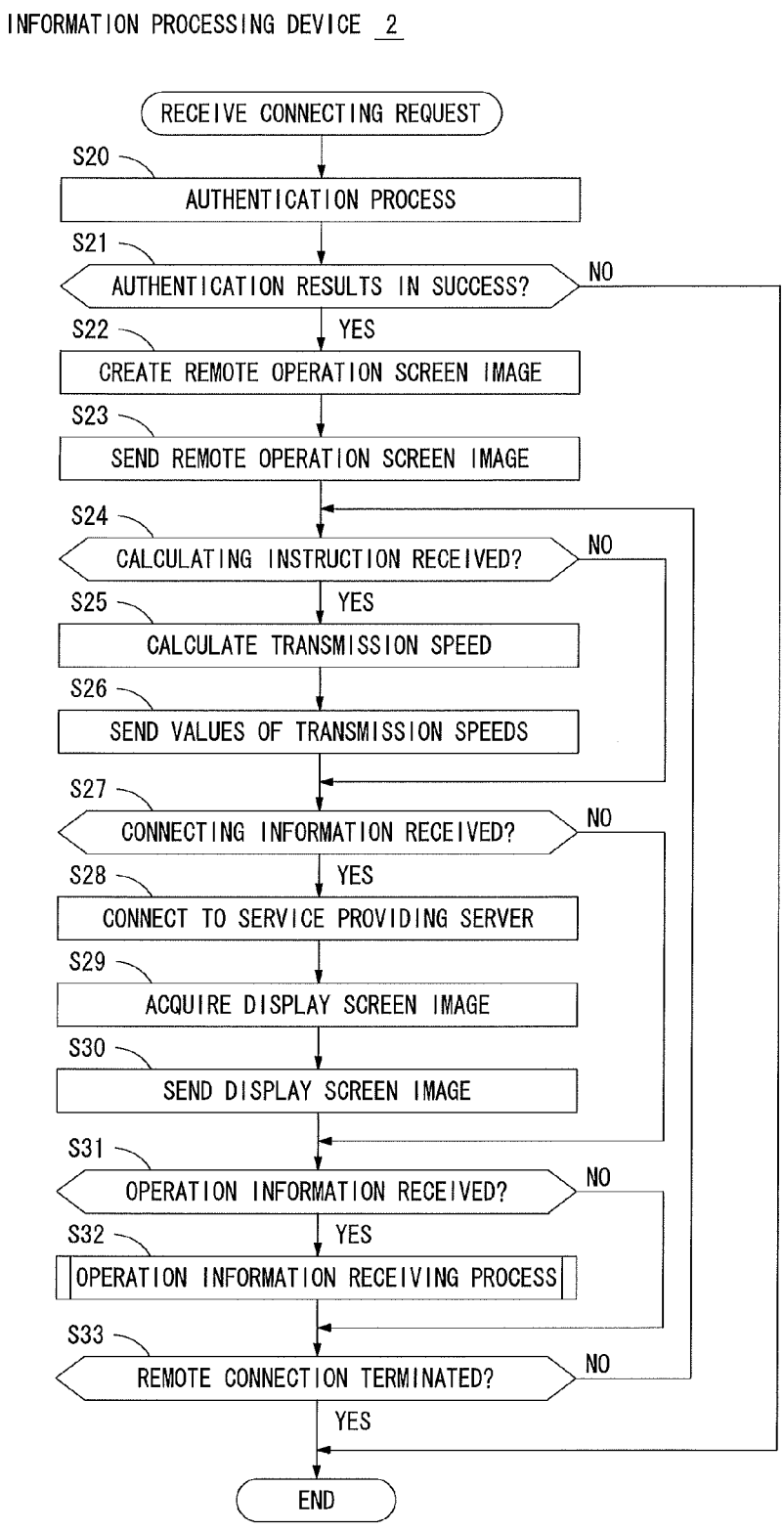
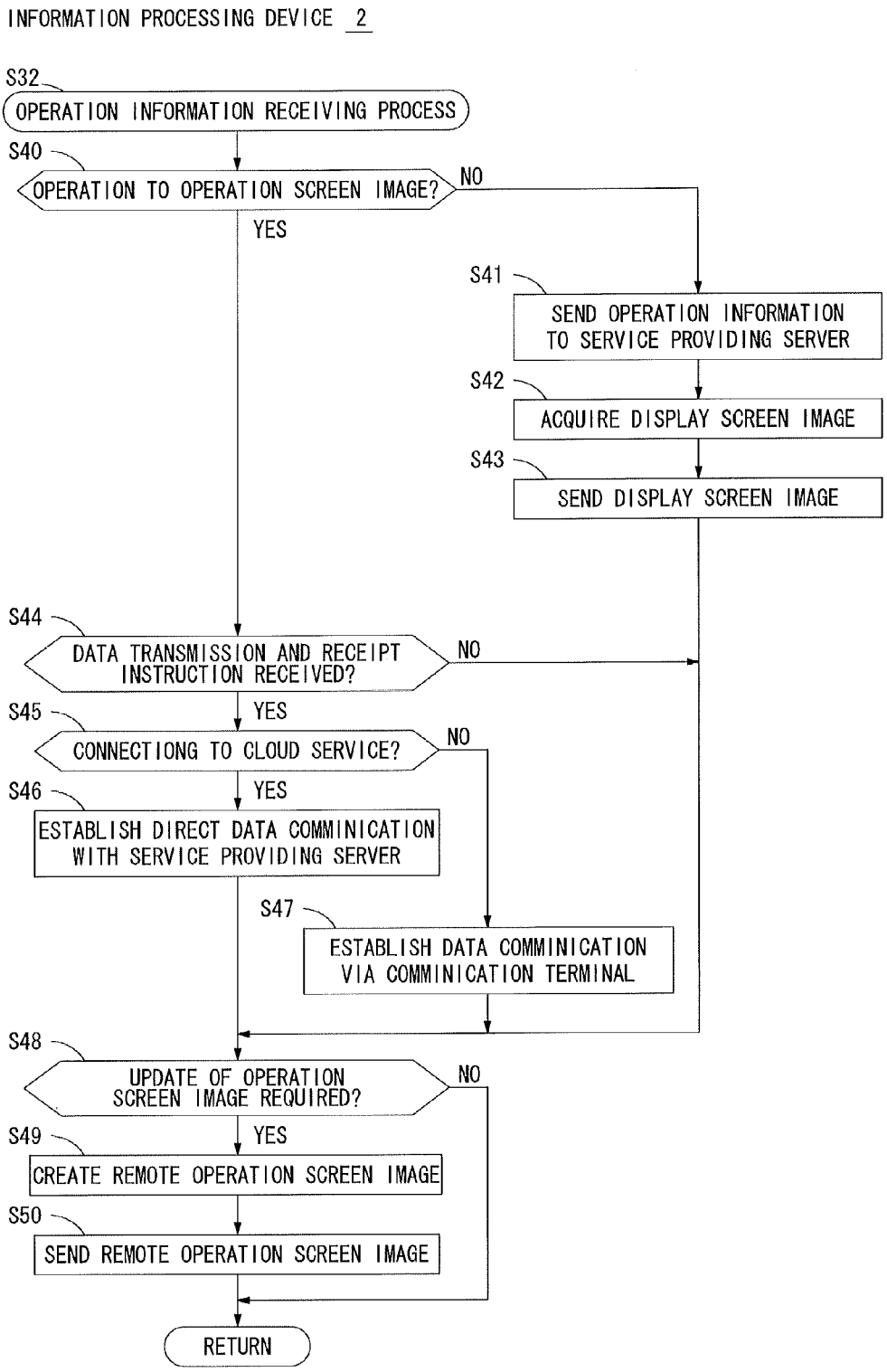

INFORMATION PROCESSING DEVICE 2
RECEIVE CONNECTING REQUEST
S20
AUTHENTICATION PROCESS
S21
AUTHENTICATION RESULTS IN SUCCESS?
NO
YES
S22
CREATE REMOTE OPERATION SCREEN IMAGE
S23
SEND REMOTE OPERATION SCREEN IMAGE
S24
CALCULATING INSTRUCTION RECEIVED?
NO
YES
S25
CALCULATE TRANSMISSION SPEED
S26
SEND VALUES OF TRANSMISSION SPEEDS
S27
CONNECTING INFORMATION RECEIVED?
NO
YES
S28
CONNECT TO SERVICE PROVIDING SERVER
S29
ACQUIRE DISPLAY SCREEN IMAGE
S30
SEND DISPLAY SCREEN IMAGE
S31
OPERATION INFORMATION RECEIVED?
NO
YES
S32
OPERATION INFORMATION RECEIVING PROCESS
S33
REMOTE CONNECTION TERMINATED?
NO
YES
END

FIG. 20


INFORMATION PROCESSING DEVICE 2
S32
OPERATION INFORMATION RECEIVING PROCESS
S40
OPERATION TO OPERATION SCREEN IMAGE?
NO
YES
S41
SEND OPERATION INFORMATION TO SERVICE PROVIDING SERVER
S42
ACQUIRE DISPLAY SCREEN IMAGE
S43
SEND DISPLAY SCREEN IMAGE
S44
DATA TRANSMISSION AND RECEIPT INSTRUCTION RECEIVED?
NO
YES
S45
CONNECTIONG TO CLOUD SERVICE?
NO
YES
S46
ESTABLISH DIRECT DATA COMMINICATION WITH SERVICE PROVIDING SERVER
S47
ESTABLISH DATA COMMINICATION VIA COMMINICATION TERMINAL
S48
UPDATE OF OPERATION SCREEN IMAGE REQUIRED?
NO
YES
S49
CREATE REMOTE OPERATION SCREEN IMAGE
S50
SEND REMOTE OPERATION SCREEN IMAGE
RETURN

INFORMATION PROCESSING DEVICE USING DIRECT DATA ACCESS FROM CLOUD STORAGE

This application is based on the application No. 2012-059582 filed in Japan, the contents of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an information processing system, a communication terminal, an information processing device and a non-transitory computer readable recording medium. The present invention more specifically relates to a technique of operating the information processing device by remote control via the communication terminal.

2. Description of the Background Art

Conventional information processing devices called as MFPs (Multi-Function Peripherals) including print and/or scan function are generally used with network access and are allowed to transmit and receive a variety of data such as document data. By way of example, the information processing device may send image data generated by reading a document to a service provider when the information processing device such as one of MFPs and the service provider are allowed to establish communication therebetween, thereby registering the image data with the service provider. This known technique is introduced for example in Japanese Patent Application Laid-Open No. JP 2006-302145 A.

Especially in these days, several companies have launched cloud services providing a storage on which a variety of data such as document data can be stored over an internet. The information processing device is allowed to access a service providing server which provides the cloud service over the internet in response to user's instruction, and transmit and receive data to and from the service providing server.

In recent years, communication terminals such as tablet terminals or smart phones have become widely popular. This type of communication terminal includes a function allowing radio connection to a network such as LAN (Local Area Network) or WAN (Wide Area Network), or public phone lines. Thus, internet accessible environment gives the user access to the service providing server to use the cloud service any time, anywhere on the communication terminal. The communication terminals are expected to increase in popularity in the future, and in response to the increase in popularity, the cloud service may be used by the user on the communication terminal in an environment such as an office, for example.

In such an above-mentioned case, the user might upload image data generated by reading a document with scan function on the information processing device, or download data stored with the cloud service to the information processing device to produce a printed output while he or she is using the cloud service on the communication terminal. In this case, however, the user needs to make the information processing device access to the cloud service the same as that accessed by the user on the communication terminal by operating the information processing device.

The information processing device placed at a place such as the office, however is shared and used by multiple users. The information processing device generally does not store therein information including that as to the cloud service, which is used by an individual user. When the user operates the information processing device to make access to the cloud service, he or she is required to enter information such as an address or an account of the service providing server by manual, resulting in poor operability. This problem also arises in the known technique introduced for example in Japanese Patent Application Laid-Open No. JP 2006-302145 A.

The user may be allowed to make the information processing device log into the cloud service by operating the information processing device. Even in such a case, the user needs to find a folder to upload data, or a file to download by continuing the operation on the information processing device. If he or she had already made operation in advance to look for a folder to upload data, or a file to download on the communication terminal, he or she has to make the same operation again on the information processing device, resulting in poor operation efficiency.

Recently, a short distance radio communication such as NFC (Near Field Communication) between the communication terminal and the information processing device has become possible to make a display screen image displayed on an operational panel of the information processing device display with the communication terminal. In this case, the communication terminal serves as a remote operational panel to operate the information processing device by remote control. When, however, the communication terminal serves as the remote operational panel as connecting to the cloud service, two of the same display screens, the display screen image acquired by the information processing device, which is logged into the cloud service, and the display screen image acquired by itself after logging into the cloud service are displayed with the communication terminal. This confuses the user, who wonders the operation to specify the folder in response to which display screen image is right to upload the data from the information processing device to the cloud service, or to download the data stored with the cloud service to the information processing device and produce the printed output. This results in extremely poor operability.

SUMMARY OF THE INVENTION

The present invention is intended to solve the above problems. Thus, the present invention is intended to provide an information processing system, a communication terminal, an information processing device and a non-transitory computer readable recording medium capable of realizing enhanced operability of data communication between the information processing device and a service providing server, which provides a cloud service, and efficient data communication with allowing a user to make operation on the communication terminal.

First, the present invention is directed to an information processing system comprising a communication terminal and an information processing device that allow communication therebetween.

According to an aspect of the information processing system, the communication terminal includes: a display part on which a variety of information is displayed to a user; a remote controlling part for acquiring an operation screen image, with which the user makes remote operation of the information processing device, by establishing communication with the information processing device in response to user's instruction, and causing the acquired operation screen image to be displayed on the display part; and a cloud service connecting part for connecting to a service providing server providing a cloud service over a network, and acquiring a display screen image for using the cloud service from the service providing server in response to user's instruction, thereby causing the acquired display screen image to be displayed on the display part together with the operation screen image displayed by

the remote controlling part. The remote controlling part of the communication terminal sends connecting information for connecting to the service providing server to the information processing device as the cloud service connecting part is connecting to the service providing server. The information processing device includes: a communicating part for connecting to the service providing server over the network, and establishing communication with the service providing server in accordance with the connecting information received from the communication terminal; and a screen image transmitting part for sending a display screen image acquired by the communicating part from the service providing server to the communication terminal, and the remote controlling part of the communication terminal switches the display screen image displayed by the cloud service connecting part on the display part to the display screen image acquired by the information processing device from the service providing server when receiving the display screen image acquired from the service providing server by the information processing device, and sends user's instruction given to the switched display screen image to the information processing device.

Second, the present invention is directed to a communication terminal capable of establishing communication with an information processing device to and from which data is transmitted and received.

According to one aspect of the communication terminal, the communication terminal, comprises: a display part on which a variety of information is displayed to a user; a remote controlling part for acquiring an operation screen image, with which the user makes remote operation of the information processing device, by establishing communication with the information processing device in response to user's instruction, and causing the acquired operation screen image to be displayed on the display part; and a cloud service connecting part for connecting to a service providing server providing a cloud service over a network, and acquiring a display screen image for using the cloud service from the service providing server in response to user's instruction, thereby causing the acquired display screen image to be displayed on the display part together with the operation screen image displayed by the remote controlling part. The remote controlling part, as the cloud service connecting part is connecting to the service providing server, sends connecting information for connecting to the service providing server to the information processing device to cause the information processing device to establish communication with the service providing server, thereby acquiring a display screen image for using the cloud service from the information processing device to switch the display screen image displayed by the cloud service connecting part on the display part to the display screen image acquired by the information processing device from the service providing server and sending user's instruction given to the switched display screen image to the information processing device.

Third, the present invention is directed to an information processing device capable of establishing communication with a communication terminal. The communication terminal is connected to a service providing server providing a cloud service.

According to one aspect of the information processing device, the information processing device, comprises: a communicating part for connecting to the service providing server over a network, and establishing communication with the service providing server in accordance with connecting information, the connecting information being received from the communication terminal as the communication terminal is connecting to the service providing server; a screen image transmitting part for creating an operation screen image for remote operation on the communication terminal and sending the operation screen image to the communication terminal, and for sending a display screen image acquired by the communicating part from the service providing server to the communication terminal by establishing communication with the communication terminal; and a job controlling part for directly transmitting and receiving data to and from the service providing server through the communicating part to execute a job without connecting via the communication terminal when an instruction on data transmission and receipt to and from the service providing server is received from the communication terminal as the communicating part is connecting to the service providing server.

Forth, the present invention is directed to a non-transitory computer readable recording medium on which a program is recorded. The program is executable on a communication terminal capable of connecting to a service providing server providing a cloud service by running an application. The program causes the communication terminal to establish communication with an information processing device, to and from which data is transmitted and received, thereby remotely controlling the information processing device.

According to an aspect of the non-transitory computer readable recording medium, the program executed on the communication terminal to function as a system comprises: a screen image controlling part for acquiring an operation screen image, with which a user makes remote operation of the information processing device, by establishing communication with the information processing device, and causing the acquired operation screen image to be displayed on a predetermined display part; a connection detecting part for detecting that the application is connecting to the service providing server; and a communication path switching part for sending connecting information for connecting to the service providing server to the information processing device, and causing the information processing device to establish communication with the service providing server as the application is connecting to the service providing server. The screen image controlling part, as the information processing device starts communication with the service providing server in response to sending the connecting information to the information processing device by the communication path switching part, acquires a display screen image for using the cloud service from the information processing device to switch a display screen image for using the cloud service, which is displayed on the display part by the application, to the display screen image acquired from the information processing device, and sends user's instruction given to the switched display screen image to the information processing device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows an exemplary configuration of an information processing system;

FIG. **2** is a block diagram showing an exemplary hardware configuration of a communication terminal;

FIG. **3** is a block diagram showing an exemplary functional configuration of a controller realized when each of an application program and a remote controlling program is running on the communication terminal;

FIG. **4** is an example of a display screen image displayed on a display unit by a cloud service connecting application;

FIG. **5** is an example of a remote operation screen image displayed on the display unit by a screen image controlling part of a remote controlling part;

FIG. **6** is an example of split screen when the cloud service connecting application and the remote controlling part are brought into operation at the same time;

FIG. **7** shows a concept of transmission speed in each path between an information processing device and a service providing server;

FIG. **8** shows a concept of display screen switching;

FIG. **9** is an example of split screen display after the screen switching by the screen image controlling part of the remote controlling part;

FIG. **10** is a block diagram showing an exemplary hardware configuration of the information processing device;

FIG. **11** is an example of screen image displayed on the display unit of the communication terminal as upload to a cloud service becomes available;

FIG. **12** is an example of screen image displayed on the display unit of the communication terminal as download from the cloud service becomes available;

FIG. **13** is an exemplary sequential procedure of the process performed by the communication terminal and the information processing device in cooperation with each other;

FIG. **14** is an exemplary sequential procedure of the process performed by the communication terminal and the information processing device in cooperation with each other;

FIG. **15** is an exemplary sequential procedure of the process performed by the communication terminal and the information processing device in cooperation with each other;

FIG. **16** is an exemplary sequential procedure of the process performed by the communication terminal and the information processing device in cooperation with each other;

FIG. **17** is an exemplary sequential procedure of the process performed by the communication terminal and the information processing device in cooperation with each other;

FIG. **18** is a flow diagram explaining an exemplary sequential procedure of the process performed on the communication terminal;

FIG. **19** is a flow diagram explaining an exemplary sequential procedure of the process performed on the information processing device; and

FIG. **20** is a flow diagram explaining an exemplary sequential procedure of the process performed on the information processing device.

DESCRIPTION OF THE PRESENT PREFERRED EMBODIMENTS

A preferred embodiment of the present invention is described in detail below with reference to figures. In the description given below, those elements which are shared in common among figures are represented by the same reference numerals, and these elements are not discussed repeatedly for the same description.

FIG. **1** shows an exemplary configuration of an information processing system **1** of the present preferred embodiment. The information processing system **1** comprises an information processing device **2** formed from a device such as one of MFPs and a communication terminal **3** used by a user with usually carrying it with him or her. On the information processing system **1**, each of the information processing device **2** and the communication terminal **3** is capable of accessing a service providing server **4** that provides a cloud service over a network **5**. The network **5** includes LAN and/or WAN or public phone lines and/or internet networks.

The information processing device **2** having multiple functions including copy, scan, print and box function, for example, besides function to establish data communication over the network **5**. Scan function is to drive a scanner section **6** provided at the upper part of the device body of the information processing device **2** to read image of a document and generate image data thereof. Print function is to drive a printer section **7** provided at the central part of the device body of the information processing device **2** to produce a printed output. Copy function is to activate scan and print function in series to copy an image of a document and produce a copied output. Box function is to store a variety of data in a storage region (box) described later. The image data generated with scan function or data received over the network **5**, for example, is stored in the storage region. These scan, print and box functions may operate in relative to data communication function to establish data communication over the network **5**. For scan function, for instance, the image data generated by reading the document may be sent to outside with data communication function. For print function, the printed output may be produced based on image data acquired from outside with data communication function. This type of information processing device **2** placed at a place such as an office is used by multiple users.

An operational panel **8**, a user interface operable by a user in use of the information processing device **2** is provided at the front part of the device body of the information processing device **2**. The information processing device **2** puts at least one of the above-mentioned multiple functions into operation to execute a job specified by the user in response to user's instruction given through the operational panel **8**, for example.

The information processing device **2** includes a function to establish a short distance radio communication with a specific device placed within a range of a predetermined distance with NFC (Near Field Communication). The information processing device **2** including short distance radio communication function is capable of establishing communication one-to-one with the communication terminal **3** carried by the user who is trying to use the information processing device **2**. A variety of data including the image data generated in response to scan function may be transmitted and received to and from the communication terminal **3**.

The communication terminal **3** is a portable information terminal device formed from a device such as a tablet terminal or a smart phone. The communication terminal **3** is owned by an individual user. The communication terminal **3** includes two types of radio communication functions. One is to establish data communication with other devices over the network **5** and another is to establish short distance radio communication with a specific device placed in the range of the predetermined distance with NFC. A various types of application programs are allowed to be installed on the communication terminal **3**. The application program to use the cloud service provided by the service providing server **4** may be installed in advance on the communication terminal **3**. With running the installed application program, the user may use the cloud service provided by the service providing server **4** any time, anywhere he or she wants through the communication terminal **3**.

The communication terminal **3** establishes short distance radio communication with the information processing device **2**, thereby serving as a remote operational panel of the information processing device **2**. As serving as the remote operational panel of the information processing device **2**, the communication terminal **3** acquires a display screen image to be displayed on the operational panel **8** of the information pro-

cessing device **2**, and displays the acquired display screen image on a display unit **15**. With receipt of the user's instruction in response to the displayed display screen image, the communication terminal **3** sends the instruction to the information processing device **2**. Thus, the user is allowed to give an instruction to the information processing device **2** on the communication terminal **3** without directly operating the operational panel **8** of the information processing device **2**.

The service providing server **4** is installed on the internet, for example, and provides a variety of cloud services over the internet. The service providing server **4** creates an account for each registered user, for example, and sets a predetermined dedicated data storage region for each account, available for each registered user. The service providing server **4** provides the service for the registered user to upload data to the respective data storage region over the network **5**, or to download data in the respective data storage region. This type of service providing server **4** is generally installed on the internet and the number of which is not just one. The example of FIG. **1** shows only one of the service providing servers **4** generally installed on the internet.

On the information processing system **1** configured as described above, the user normally uses his or her communication terminal **3** to establish connection C**1** with the cloud service provided by the service providing server **4**, thereby using the cloud service. The user sometimes would like to upload the image data generated by reading the document on the information processing device **2** to the cloud service or to download the data stored with the cloud service to the information processing device **2** and produce the printed output based on the downloaded data. In such a case, the communication terminal **3** is caused to serve as the remote operational panel of the information processing device **2**, and short distance radio communication C**3** is caused to be established between the communication terminal **3** and the information processing device **2** by the user. In response to establishing short distance radio communication C**3**, the information processing device **2** is operated by remote control on the communication terminal **3** by the user.

There are two transmission paths that allow the information processing device **2** to establish data communication with the service providing server **4**. The first path is to follow a path C**2** over which the information processing device **2** establishes direct data communication with the service providing server **4**. The second path is to follow paths C**2** and C**3** over which the information processing device **2** establishes data communication with the service providing server **4** via the communication terminal **3**.

When uploading from the information processing device **2**, or downloading to the information processing device **2**, the communication terminal **3** determines either the first or second path realizes efficient data transmission. If the first path allows efficient data transmission, the communication terminal **3** controls the information processing device **2**, thereby causing the information processing device **2** to establish connection C**2** so that the information processing device **2** may establish direct data communication with the service providing server **4**. The communication terminal **3** then sends an uploading instruction or a downloading instruction to the information processing device **2**, and controls the information processing device **2** to establish direct data communication with the service providing server **4** over the network **5**. The communication terminal **3** and the information processing device **2** operating in this manner are explained more in detail next.

The communication terminal **3** is described next. FIG. **2** is a block diagram showing an exemplary hardware configuration of the communication terminal **3**. As illustrated in FIG. **2**, the communication terminal **3** includes a controller **10**, a network communication controller **13**, a short distance radio communication controller **14**, the display unit **15**, a manipulation input unit **16** and a storage unit **17**. The communication terminal **3** formed from the device such as the smart phone includes a microphone or a speaker besides the above-mentioned units to make a voice call.

The controller **10** including a CPU **11** and a memory **12** controls operations of each processing part. The CPU **11** executes various types of programs stored on the storage unit **17**. The memory **12** stores therein data such as temporary data required in accordance with execution of each program by the CPU **11**.

The network communication controller **13** controls data communication when the data communication is established over the network **5** by the controller **10**. The short distance radio communication controller **14** controls short distance radio communication when the communication is established with the information processing device **2** by the controller **10**. Once the short distance radio communication becomes available with the information processing device **2**, for example, the short distance radio communication controller **14** automatically detects it and notifies the controller **10**.

The display unit **15** on which various types of information is displayed to the user of the communication terminal **3** is formed from a device such as a color liquid crystal display, for example. The manipulation input unit **16** formed with parts such as touch panel sensors arranged on the screen of the display unit **15**, for example, receives entries by the user of the communication terminal **3**.

The storage unit **17** is formed from a nonvolatile storage device such as a solid state drive (SSD). The storage unit **17** stores therein as a program executed by the CPU **11** a plurality of application programs **21** used by the user and a remote controlling program **22** for operating the information processing device **2** by remote control.

The plurality of application programs **21** include a program for the communication terminal **3** to connect to the service providing server **4** and use the cloud service. When, for example, more than one cloud services is used by the user, the plurality of application programs **21** corresponding to each of the more than one cloud services are stored in the storage unit **17**.

The storage unit **17** stores therein a variety of data and information besides the programs. As an example of the variety of data and information, a destination address **23**, authentication information **24** and user information **25** are shown in FIG. **2**. The destination address **23** is required for access to the service providing server **4** from the communication terminal **3**. The destination address **23** is an address such as a URL (Uniform Resource Locator), for instance. The authentication information **24** is used when the communication terminal **3** logs into a user-specific account registered in advance with the service providing server **4**. The authentication information **24** is information about a user ID or a password registered in advance with the service providing server **4**. For the user using more than one cloud services, the authentication information **24** is stored for each cloud service. The user information **25** is information about the user of the communication terminal **3**. The user information **25** is information required for the use of the information processing device **2**, and is sent to the information processing device **2** when the communication terminal **3** starts operating the information processing device **2** by remote control. The communication terminal **3** sends the user information **25** to the information processing device **2**, thereby making the information processing device **2**

perform user authentication to authenticate if the user who performs remote operation is a registered user.

In response to the user's instruction, the above-described communication terminal **3** starts up each of the application program **21** and the remote controlling program **22**. FIG. **3** is a block diagram showing an exemplary functional configuration of the controller **10** realized when each of the application program **21** and the remote controlling program **22** is running on the communication terminal **3**. As shown in FIG. **3**, in response to running the application program **21** on the communication terminal **3**, the controller **10** serves as a cloud service connecting application **30**. As the remote controlling program **22** runs on the communication terminal **3**, the controller **10** serves as a remote controlling part **31**. Each of the cloud service connecting application **30** and the remote controlling program **22** is capable of reading the destination address **23**, the authentication information **24** and the user information **25** stored in the storage unit **17**, respectively, as required.

After being in operation on the controller **10**, the cloud service connecting application **30** reads the destination address **23** and accesses the service providing server **4** over the network **5** through the network communication controller **13**. The cloud service connecting application **30** then reads the authentication information **24** in response to the request from the service providing server **4**, and sends the read authentication information **24** to the service providing server **4**. Thus, the cloud service connecting application **30** is allowed to automatically log into the user-specific account on the cloud service at its start up.

After automatically logging into the user-specific account, the cloud service connecting application **30** acquires a display screen image required for using the cloud service from the service providing server **4**, and displays the acquired display screen image on the display unit **15**. So, the cloud service connecting application **30** acquires the display screen image for using the cloud service from the service providing server **4** by following the communication path C**1** shown in FIG. **1**, and displays the acquired display screen image on the display unit **15**. Also, the cloud service connecting application **30** receives user's instruction which is made in response to the display screen image from the manipulation input unit **16**, and sends the operation information corresponding to the user's instruction to the service providing server **4**. Thus, the display screen image displayed on the display unit **15** is updated almost immediately.

FIG. **4** is an example of the display screen image displayed on the display unit **15** in response to starting up of the cloud service connecting application **30** on the controller **10**. As shown in FIG. **4**, the display screen image displayed by the cloud service connecting application **30** on the display unit **15** by acquiring the image from the service providing server **4** includes a folder selecting field **41** and a file display field **42**. The folder selecting field **41** shows multiple folders in which a variety of data is stored, and is pressed to select one of the folders. The file display field **42** shows a list of data files that are stored in the folder selected by pressing the folder selecting field **41**. The user makes operation in response to such display screen image, and he or she is allowed to view the data stored with the cloud service, or to specify a folder to upload or a file to download.

Referring back to FIG. **3**, after being in operation on the controller **10**, the remote controlling part **31** establishes the short distance radio communication with the information processing device **2** through the short distance radio communication controller **14**. With the short distance radio communication, the remote controlling part **31** acquires an operation screen image for remote operation from the information processing device **2** and displays the acquired operation screen image on the display unit **15**, and sends the user's instruction in response to the displayed operation screen image to the information processing device **2**. If the short distance radio communication with the information processing device **2** is not available at its start up, the remote controlling part **31** terminates and completes the start up process. If the short distance radio communication with the information processing device **2** is available, the remote controlling part **31** completes the start up process normally. After completing the start up process normally, the remote controlling part **31** serves as a user authenticating part **32**, a screen image controlling part **33**, a cloud service connection detecting part **34**, a transmission speed determining part **35** and a communication path switching part **36**.

The user authenticating part **32** is brought into operation in response to start up of the remote controlling part **31** to read the user information **25** in the storage unit **17** and send the read user information **25** to the information processing device **2**. The information processing device **2** performs the authentication process to determine if the user is the registered user in accordance with the user information **25**, and sends the authentication result to the communication terminal **3**. After the user is authenticated as the registered user based on the authentication result, the user authenticating part **32** brings the screen image controlling part **33**, the cloud service connection detecting part **34**, the transmission speed determining part **35** and the communication path switching part **36** into operation.

The screen image controlling part **33** controls overall screen image displayed on the display unit **15** as the remote controlling part **31** is brought into operation on the communication terminal **3**. To be more specific, the screen image controlling part **33** acquires the operation screen image for remote operation from the information processing device **2** and displays the acquired operation screen image on the display unit **15**, and sends operation information based on the user's instruction in response to the displayed operation screen image to the information processing device **2**.

FIG. **5** is an example of the remote operation screen image displayed on the display unit **15** by the screen image controlling part **33**. After acquiring the operation screen image from the information processing device **2**, the screen image controlling part **33** displays the operation screen image corresponding to each function on the information processing device **2** on the display unit **15**. A function selecting field **43** is shown in a bottom part of the operation screen image. The function selecting field **43** shows multiple functions including copy, scan, print and box functions, and is pressed to select a desired function. A start button **44** pressed to give an instruction to start job execution to the information processing device **2** is also shown in the operation screen image. By making operation in response to such remote operation screen image, the user is allowed to give instructions to the information processing device **2**.

The cloud service connection detecting part **34** detects whether or not the aforementioned cloud service connecting application **30** is running and the communication terminal **3** is connecting to the cloud service over the network **5**. If the cloud service connecting application **30** is not running as the remote controlling part **31** is brought into operation, the cloud service connection detecting part **34** monitors whether or not the cloud service connecting application **30** is to be started up. Upon the start up of the cloud service connecting application **30**, the cloud service connection detecting part **34** detects the start up. The cloud service connection detecting part **34** then

specifies the destination address **23** and the authentication **24** to be used by the cloud service connecting application **30**. When the cloud service connecting application **30** has already been running as the remote controlling part **31** is brought into operation, the cloud service connection detecting part **34** detects that the cloud service connecting application **30** is running soon after it is brought into operation, and specifies the destination address **23** and the authentication **24** used by the cloud service connecting application **30**.

After detecting that the cloud service connecting application **30** is connecting to the cloud service as described above, the cloud service connection detecting part **34** notifies the screen image controlling part **33** and the transmission speed determining part **35** of the detection result.

The screen image controlling part **33** detects that the cloud service connecting application **30** is connecting to the cloud service. In such a case, the screen image controlling part **33** splits and displays the screen image to be displayed on the display unit **15**, for example. FIG. **6** is an example of split screen when the cloud service connecting application **30** and the remote controlling part **31** are brought into operation at the same time. The screen image controlling part **33** splits the screen of the display unit **15** as illustrated in FIG. **6**, for instance, and displays a display screen image **15***a* required for using the cloud service and an operation screen image **15***b* required for remote operation of the information processing device **2** in parallel when the cloud service connecting application **30** and the remote controlling part **31** are brought into operation at the same time. With this split screen, the user is allowed to make operations in response to the display screen image **15***a* for using the cloud service and the operation screen image **15***b* for remote operation of the information processing device **2** at the same time.

In response to detecting connection to the cloud service by the cloud service connecting application **30**, the transmission speed determining part **35** determines which of transmission paths, the aforementioned first path or the second path, realizes more efficient data transmission between the information processing device **2** and the cloud service.

In order to determine efficiency, the transmission speed determining part **35** calculates each transmission speed of data transmission by the first path and the second path. FIG. **7** shows a concept of the transmission speed in each path. It is assumed that data transmission speed V**1** is a rate calculated in data transmission through the first path. So, the transmission speed V**1** is a rate calculated in direct data transmission between the information processing device **2** and the service providing server **4** through a path C**2** (see FIG. **1**). It is also assumed that data transmission speed V**2** is a rate calculated in data transmission through the second path. So, the transmission speed V**2** is a rate calculated in data transmission between the information processing device **2** and the service providing server **4** via the communication terminal **3** through paths C**1** and C**3**. The transmission speed V**2** shall be obtained by calculating the transmission speed V**2***a* in the path C**3** and the transmission speed V**2***b* in the path C**1** as shown in FIG. **7**.

The transmission speed determining part **35** calculates the transmission speed V**2***a* in the path C**3** between the information processing device **2** and the communication terminal **3** by sending a response command such as a ping command, for instance, then receiving the response to the response command from the information processing device **2**. Similarly, the transmission speed determining part **35** calculates the transmission speed V**2***b* in the path C**1** between the service providing server **4** and the communication terminal **3** by sending the response command to the service providing server **4**, to which the cloud service connecting application **30** is connecting, then receiving the response to the response command from the service providing server **4**. The transmission speed determining part **35** obtains a value of the transmission speed V**2** in the second path with the calculated values of the transmission speed V**2***a* and V**2***b*.

The transmission speed determining part **35** sends a calculating instruction to calculate the transmission speed V**1** to the information processing device **2**. In response to receiving the calculating instruction, the information processing device **2** calculates the transmission speed V**1** in the path C**2** between the service providing server **4** and itself by sending the response command such as the ping command, for example, to the service providing server **4**, then receiving the response to the response command from the service providing server **4**. The information processing device **2** then sends the obtained value of the transmission speed V**1** to the communication terminal **3**. The transmission speed determining part **35** thereby obtains the value of the transmission speed V**1**.

As described above, the transmission speed determining part **35** obtains the values of the transmission speed V**1** in the first path and the transmission speed V**2** in the second path. With the values of the transmission speed V**1** and the transmission speed V**2**, the transmission speed determining part **35** compares the values and determines which transmission path, the first or the second path, realizes data transmission at a higher rate. It may be determined that more efficient data transmission is realized at a rate of the transmission speed V**2** in the second path. In this case, connection over the transmission path through the second path has already been established. So, the process by the transmission speed determining part **35** is complete. It may be determined that more efficient data transmission is realized at a rate of the transmission speed V**1** in the first path. In this case, connection over the transmission path through the first path is established yet. The transmission speed determining part **35** then brings the transmission path switching part **36** into operation.

The transmission path switching part **36** causes the information processing device **2** to establish connection through the first path by which direct communication with the service providing server **4** is allowed. The transmission path switching part **36** generates connecting information for access to the service providing server **4** to which the cloud service connecting application **30** is connecting. More specifically, the transmission path switching part **36** reads the destination address **23** and the authentication information **24** in the storage unit **17**, which are used when the cloud service connecting application **30** accesses the service providing server **4**, and generates the connecting information containing the read destination address **23** and authentication information **24**. The transmission path switching part **36** then sends the generated connecting information for using the cloud service to the information processing device **2**. Thus, the information processing device **2** is allowed to connect to the service providing server **4** with the connecting information received from the transmission path switching part **36** and to automatically log into a user-specific account of the cloud service provided by the service providing server **4**.

When sending the generated connecting information to the information processing device **2**, the transmission path switching part **36** detects access state as of then which is instructed by the user to the cloud service connecting application **30**, and sends the connecting information containing the detected access state. So, the information processing device **2** is allowed to replicate the state the same as the usage state of the cloud service by the cloud service connecting application **30** based on the access state information after automatically logging into the user-specific account of the

cloud service. To be more specific, the user may make operations to the cloud service connecting application **30**, thereby specifying a folder to upload or a file to download. In this case, the information processing device **2** is allowed to provide the cloud service with specifying the same folder or file after automatically logging into the user-specific account of the cloud service.

The remote controlling part **31** causes the information processing device **2** to directly access the service providing server **4** through the first path as described above. The remote controlling part **31** then obtains the display screen image for using the cloud service via the information processing device **2**. In this case also, the screen image controlling part **33** is brought into operation on the remote controlling part **31** to perform process in response to the obtained display screen image.

After obtaining the display screen image which is acquired by the information processing device **2** from the service providing server **4**, the screen image controlling part **33** switches the display screen image displayed by the cloud service connecting application **30** on the display unit **15** to the display screen image acquired by the information processing device **2** from the service providing server **4**.

FIG. **8** shows a concept of display screen switching. As illustrated in FIG. **8**, a display screen image G**1** which is acquired by the cloud service connecting application **30** from the service providing server **4** is displayed on the display unit **15** as the display screen image **15***a* for using the cloud service before the display screen switching. As the operation screen image **15***b* for remote operation of the information processing device **2**, an operation screen image G**2** obtained from the information processing device **2** is displayed.

In response to obtaining the display screen image which is acquired by the information processing device **2** from the service providing server **4**, the screen image controlling part **33** switches the display screen image as shown in FIG. **8**. With this display screen switching, a display screen image G**3** which is acquired by the information processing device **2** from the service providing server **4** is displayed as the display screen image **15***a* for using the cloud service. The same operation screen image G**2** obtained from the information processing device **2** is kept being displayed as the operation screen image **15***b* for remote operation of the information processing device **2** before and after the display screen switching. The display screen image G**3** displayed by the display screen switching shows the same display screen as the current display screen image G**1**. In order to notify the user of the switching of the display screen image **15***a* for using the cloud service, an image indicating that the screen image being displayed is the one acquired by the information processing device **2** from the service providing server **4** may be attached to the margins of the display screen image G**3**, for example, and displayed.

FIG. **9** is an example of split screen display after the screen switching by the screen image controlling part **33**. As illustrated in FIG. **9**, the split screen display after the screen switching shows almost the same display screen before the screen switching (for instance, the display screen of FIG. **6**). In the example of the display screen of FIG. **9**, an image **46** indicating that the screen image being displayed is the one acquired by the information processing device **2** from the service providing server **4** is attached to the margins of the display screen image **15***a* for using of the cloud service. The user is allowed to see the display screen image **15***a* is acquired through either path by checking the presence of the image **46**. Further, the access state to the cloud service in response to the display screen image **15***a* is maintained before and after the screen switching. The user, therefore, does not have to care of the screen switching, and he or she is allowed to continue the operation from the state before screen switching.

The information processing device **2** is explained next. FIG. **10** is a block diagram showing an exemplary hardware configuration of the information processing device **2**. The information processing device **2** includes a controller **50**, a short distance radio communication controller **51**, a network communication controller **52** and a storage device **53** as shown in FIG. **10** besides the aforementioned scanner section **6**, the printer section **7** and the operational panel **8**.

The controller **50** includes a CPU and a memory not shown in FIG. **10**, which is the same as the communication terminal **3**. The CPU executes a predetermined program so that the controller **50** serves as a received information analyzing part **61**, an authenticating part **62**, a screen image transmitting part **63**, a data communicating part **64** and a job controlling part **65**.

The short distance radio communication controller **51** controls short distance radio communication when the communication is established with the communication terminal **3** by the controller **50**. Once the short distance radio communication becomes available with the communication terminal **3**, the short distance radio communication controller **51** automatically detects it and notifies the controller **50**. The network communication controller **52** controls data communication when the data communication is established over the network **5** by the controller **50**. When connecting to the service providing server **4** over the network **5**, the information processing device **2** transmits and receives data to and from through the network communication controller **52**.

The storage device **53** is formed from a nonvolatile storage device such as a hard disk drive (HDD). The storage device **53** stores therein user registration information **54**, which is information registered as to the user who is authorized to use the information processing device **2** in advance, for example. The information that may identify the user such as user ID or a password, for instance, is registered as the user registration information **54**. The user registration information **54** is not necessarily stored in the storage device **53**. The user registration information **54** may be stored in another device such as another server. The storage device **53** includes at least one box **55** as a storage region to store therein data such as document data **59**. The box **55** is the storage region to store therein a variety of data when the user selects box function.

Each processing part put into operation to function on the controller **50** is described next. The received information analyzing part **61** receives information from the communication terminal **3** through the short distance radio communication controller **51**, and analyzes the received information. If the received information is a connecting request for remote operation, the received information analyzing part **61** extracts the user information **25** contained in the connecting request, and outputs the extracted user information **25** to the authenticating part **62**.

The authenticating part **62** performs authentication process in accordance with the user information **25** received from the received information analyzing part **61**. To be more specific, the authenticating part **62** reads the user registration information **54** in the storage device **53** and determines whether or not any information registered as the user registration information **54** matches the user information **25**. If the information registered as the user registration information **54** matching the user information **25** is stored, the authentication results in success. As a result, the user using the communication terminal **3** is identified as the registered user. The authenticating part **62** then puts the information processing device **2** into a

logged-in state to allow the registered user to use the information processing device **2** by remote control. After the information processing device **2** is put into the logged-in state, each of the screen image transmitting part **63**, the data communicating part **64** and the job controlling part **65** is brought into operation.

After the information processing device **2** is put into the logged-in state, the screen image transmitting part **63** creates the operation screen image for remote operation on the communication terminal **3**, and sends the created operation screen image to the communication terminal **3** through the short distance radio communication controller **51**, in response to the connecting request received by the received information analyzing part **61**. The screen image transmitting part **63** includes a remote screen image creating part **63***a*. The remote screen image creating part **63***a* creates the operation screen image for remotely operating the information processing device **2** on the communication terminal **3**. As the received information analyzing part **61** receives the operation information in response to the operation screen image from the communication terminal **3**, the remote screen image creating part **63***a* updates properly the operation screen image for remote operation based on the received operation information. The screen image transmitting part **63** sends the operation screen image, which is updated properly by the remote screen image creating part **63***a*, to the communication terminal **3** every time it is update.

When the data communicating part **64** accesses the service providing server **4** and acquires the display screen image for using the cloud service, the screen image transmitting part **63** sends the acquired display screen image to the communication terminal **3** through the short distance radio communication controller **51**. The screen image transmitting part **63** may attach the image **46** indicating that the screen image is acquired by the information processing device **2** from the service providing server **4** to the margins of the display screen image acquired by the data communicating part **64** from the service providing server **4**.

In response to receiving the calculating instruction of the transmission speed V**1** of data transmission to and from the service providing server **4** from the communication terminal **3**, the received information analyzing part **61** causes the data communicating part **64** to calculate the transmission speed. More specifically, the data communicating part **64** sends the response command such as the ping command, for instance, to an IP address of the service providing server **4**, which is contained in the calculating instruction from the communication terminal **3**, then receiving the response from the service providing server **4**, thereby calculating the transmission speed V**1**, which is a rate of direct data communication with the service providing server **4**. The data communicating part **64** sends the value of the transmission speed V**1** thereby obtained to the communication terminal **3**.

After receiving the connecting information for access to the service providing server **4** from the communication terminal **3**, the received information analyzing part **61** outputs the received connecting information to the data communicating part **64**. The communicating part **64** connects to the service providing server **4** through the network communication controller **52** based on the connecting information. The connecting information received from the communication terminal **3** contains the destination address **23** and the authentication information **24** for log-in to the user-specific account of the cloud service as described above. The communicating part **64** directly connects to the service providing server **4** over the network **5** in accordance with the destination address **23**, and automatically logs into the cloud service with the authentication information **24** so that the cloud service becomes available.

As automatically logging into the service providing server **4**, the communicating part **64** acquires the display screen image for using the cloud service from the service providing server **4**. The communicating part **64** then outputs the acquired display screen image for using the cloud service to the screen image transmitting part **63**. As already explained above, the screen image transmitting part **63** sends the display screen image acquired from the service providing server **4** to the communication terminal **3**.

In response to receiving the operation information from the communication terminal **3**, the received information analyzing part **61** determines whether the operation information corresponds to the operation in response to which screen image, the operation screen image for remote operation or the display screen image for using the cloud service. If the operation is in response to the operation screen image, the received information analyzing part **61** outputs the operation information to the screen image transmitting part **63** to make the operation screen image displayed with the communication terminal **3** update based on the operation information. When the operation is in response to the operation screen image and is to give a job execution instruction, the received information analyzing part **61** instructs the job controlling part **65** to start job execution. If the operation is in response to the display screen image acquired by the communicating part **64**, the received information analyzing part **61** outputs the operation information to the communicating part **64**. Thus, the communicating part **64** sends the operation information to the service providing server **4**, and acquires the display screen image updated based on the operation information.

The job controlling part **65** is brought into operation when the operation information giving the job execution instruction is received. The job controlling part **65** controls execution of the job specified by the user of the communication terminal **3**. The job controlling part **65** drives the scanner section **6** to read the document and generate the image data thereof, or the printer section **7** to produce the printed output by outputting the image data to the printer section **7**. Also, the job controlling part **65** stores data such as the document data **59** in the box **55**, or reads the document data **59** in the box **55**. The job controlling part **65** gives a data transmission and receipt instruction to the communicating part **64**, thereby controlling direct data transmission and receipt to and from the service providing server **4**. The job controlling part **65**, for example, directly uploads data such as the image data generated by reading the document with scan function or the document data **59** stored in the box **55** to the service providing server **4** through the communicating part **64**. Moreover, the job controlling part **65** directly downloads the data stored in the service providing server **4** from the service providing server **4**, and outputs the downloaded data to the printer section **7** to make the printer section **7** produce the printed output, or stores the downloaded data in the box **55**.

As both the operation screen image for remote operation and the display screen image acquired by the communicating part **64** from the service providing server **4** have been sent to the communication terminal **3**, the screen image transmitting part **63** is allowed to get information about the operation state of the user in response to each screen image. The screen image transmitting part **63** properly determines the operation state in response to each of the two screen images. So, when data upload or download becomes available, the screen image transmitting part **63** attaches an operation button to start data upload or download to the operation screen image for remote

operation. As a result, such operation button is shown on the display unit **15** of the communication terminal **3**.

FIG. **11** is an example of the screen image displayed on the display unit **15** of the communication terminal **3** as upload to the cloud service becomes available. In the example of the screen image of FIG. **11**, one of the folders is selected by the user on the display screen image **15***a* for using the cloud service. Box function is selected and one of the files stored in the box **55** is selected by the user on the operation screen image **15***b* for remotely operating the information processing device **2**. With this operation state, the screen image transmitting part **63** determines that it enables the file selected by the user to upload to the folder on the cloud service. The screen image transmitting part **63** then attaches an operation button **47** to start data upload to the operation screen image **15***b*, and sends the operation screen image **15***b*. The operation button **47** is allowed to be shown on the display unit **15** of the communication terminal **3** as illustrated in FIG. **11**. As a result, the user presses the operation button **47** with his or her fingertips, thereby easily giving an instruction to start uploading the data. In the example of FIG. **11**, box function is selected. The operation button **47** starting data upload may be attached also in another case where scan function is selected.

FIG. **12** is an example of the screen image displayed on the display unit **15** of the communication terminal **3** as download from the cloud service becomes available. In the example of the screen image of FIG. **12**, one of the files stored in one of the folders is selected by the user on the display screen image **15***a* for using the cloud service. Box function is selected and one of the boxes is selected by the user on the operation screen image **15***b* for remotely operating the information processing device **2**. With this operation state, the screen image transmitting part **63** determines that it enables the file selected by the user among from the multiple files stored with the cloud service to download to the box of the information processing device **2**. The screen image transmitting part **63** then attaches an operation button **48** to start data download to the operation screen image **15***b*, and sends the operation screen image **15***b*. The operation button **48** is allowed to be shown on the display unit **15** of the communication terminal **3** as illustrated in FIG. **12**. As a result, the user presses the operation button **48** with his or her fingertips, thereby easily giving an instruction to start downloading the data. In the example of FIG. **12**, box function is selected. The operation button **48** starting data download may be attached also in another case where print function is selected.

The process performed by the communication terminal **3** and the information processing device **2** in cooperation with each other is explained next. FIGS. **13** to **17** are exemplary sequential procedures of the process performed by the communication terminal **3** and the information processing device **2** in cooperation with each other.

FIG. **13** is a flow diagram explaining an exemplary sequential procedure to enable the communication terminal **3** to operate the information processing device **2** by remote control. Upon start up of the remote controlling part **31** (process P**1**), the communication terminal **3** sends the connecting request to the information processing device **2** by establishing the short distance radio communication (process P**2**). The connecting request thereby sent contains the user information **25**. As receiving the connecting request from the communication terminal **3**, the information processing device **2** performs the authentication process in accordance with the user information **25** contained in the received connecting request (process P**3**). When the user of the communication terminal **3** is identified as the registered user as the result of the authentication, the information processing device **2** creates the operation screen image G**2** for remote operation on the communication terminal **3** (process P**4**), and sends the created operation screen image G**2** to the communication terminal **3** (process P**5**).

After sending the connecting request, the communication terminal **3** obtains the operation screen image G**2** from the information processing device **2**. The communication terminal **3** displays the obtained operation screen image G**2** on the display unit **15** (process P**6**). So, the user is allowed to use the information processing device **2** by remote control using the communication terminal **3**. As detecting the operation by the user in response to the operation screen image G**2** (process P**7**), the communication terminal **3** sends the operation information **28** corresponding to the detected operation to the information processing device **2**. With receipt of the operation information **28** corresponding to the operation made in response to the operation screen image G**2** from the communication terminal **3**, the information processing device **2** updates the operation screen image G**2** (process P**8**), and sends the updated operation screen image G**2** to the communication terminal **3** (process P**9**). Thus, the operation screen image G**2** displayed with the communication terminal **3** may be updated. After this, every time that operation is made in response to the operation screen image G**2** by the user, the process in P**7** to P**9** is repeatedly performed.

FIGS. **14** to **17** are exemplary sequential procedures of the process performed by the communication terminal **3** and the information processing device **2** in cooperation with each other to use the cloud service. After enabling the communication terminal **3** to operate the information processing device **2** by remote control, the communication terminal **3** starts up the cloud service connecting application **30** as shown in FIG. **14** (process P**10**) to acquire the destination address **23** of the cloud service to which the communication terminal **3** connects (process P**11**). The communication terminal **3** accesses the service providing server **4** in accordance with the destination address **23**, and sends the connecting request to the service providing server **4** (process P**12**). The connecting request thereby sent contains the authentication information **24** required for automatic log-in to the user-specific account. As receiving the authentication information **24** from the communication terminal **3**, the service providing server **4** authorizes the log-in (process P**13**). The service providing server **4** then creates the display screen image G**1** for using the cloud service and sends the created display screen image G**1** to the communication terminal **3** (processes P**14** and P**15**).

After the communication terminal **3** acquires the display screen image G**1**, the cloud service connecting application **30** displays the acquired display screen image G**1** on the display unit **15**. The remote controlling part **31** divides up the screen image in two sections to display so that both the display screen image G**1** acquired by the cloud service connecting application **30** and the operation screen image G**2** for remote operation may be displayed in parallel (process P**16**). With this split screen, the remote controlling part **31** detects that the cloud service connecting application **30** is connecting to the cloud service (process P**17**).

Going on to FIG. **15**, the remote controlling part **31** performs the process to calculate the transmission speeds V**1** and V**2**. To be more specific, the communication terminal **3** sends the response command to the information processing device **2** at first (process P**20**), then receiving the response signal, which is returned in response to the responding process (process P**21**) on the information processing device **2**. The communication terminal **3** saves the value of the transmission speed between the communication terminal **3** and the information processing device **2** (process P**22**). The communica-

tion terminal **3** then acquires the destination address **23** to which the cloud service connecting application **30** is connecting (process P**23**). The communication terminal **3** sends the response command to the service providing server **4** to which the cloud service connecting application **30** is connecting in accordance with the destination address **23** (process P**24**), then receiving the response signal, which is returned in response to the responding process (process P**25**) on the service providing server **4**. The communication terminal **3** saves the value of the transmission speed between the communication terminal **3** and the service providing server **4** (process P**26**). The communication terminal **3** sends the calculating instruction of the transmission speed to the information processing device **2** (process P**27**). The information processing device **2** sends the response command to the service providing server **4** to which the cloud service connecting application **30** is connecting (process P**28**), then receiving the response signal, which is returned in response to the responding process (process P**29**) on the service providing server **4**. The information processing device **2** calculates the transmission speed, the rate of direct data communication with the service providing server **4**, with the response signal, and sends the obtained value to the communication terminal **3** (process P**30**). The communication terminal **3** performs transmission speed determining process based on the obtained value of the transmission speed, the rate of data communication in each path C**1**, C**2** and C**3** (process P**31**). In the transmission speed determining process, it is determined either the aforementioned first or second path realizes efficient data communication when uploading or downloading data between the information processing device **2** and the service providing server **4**. If it is determined that direct data transmission and receipt to and from the service providing server **4** from the information processing device **2** is more efficient, the process moves on to FIGS. **16** and **17**.

Going to FIG. **16**, the communication terminal **3** reads and acquires the authentication information **24** required for logging into the cloud service to which the cloud service connecting application **30** is connecting (process P**40**). The communication terminal **3** generates the connecting information containing the authentication information **24**, and sends to the information processing device **2** (process P**41**). The connecting information thereby sent contains the destination address **23** for connecting to the service providing server **4** from the information processing device **2** besides the authentication information **24**. When the display screen image G**1** displayed by the cloud service connecting application **30** is not an initial screen that is shown soon after logging into the cloud service, the communication terminal **3** sends the access state information indicating the access state to the service providing server **4** in response to the display screen image G**1** to the information processing device **2**.

After receiving the connecting information, the information processing device **2** performs connecting process to the service providing server **4** (process P**42**). In the connecting process, the information processing device **2** sends the authentication information **24** received from the communication terminal **3** to the service providing server **4**. If the access state information in response to the display screen image G**1** is received from the communication terminal **3**, the information processing device **2** accesses the service providing server **4** in accordance with the received information. As receiving the authentication information **24** from the information processing device **2**, the service providing server **4** authorizes logging in (process P**43**). The service providing server **4** then creates the display screen image G**3** for using the cloud service and sends the created display screen image G**3** to the information processing device **2** (processes P**44** and P**45**). The display screen image G**3** thereby sent to the information processing device **2** shows the access state the same as that of the display screen image G**1** displayed by the cloud service connecting application **30**.

After receiving the display screen image G**3** from the service providing server **4**, the information processing device **2** sends the received display screen image G**3** to the service providing server **4** (process P**46**). As already described, the display screen image G**3** may be sent to the service providing server **4** by attaching the image **46** (see FIG. **9**) indicating that the screen image is acquired by the information processing device **2** from the service providing server **4** to the margins of the display screen image G**3**. In response to receiving the display screen image G**3** from the information processing device **2**, the communication terminal **3** switches the display screen image **15***a* for using the cloud service from the display screen image G**1** acquired by the cloud service connecting application **30** to the display screen image G**3** acquired by the information processing device **2** (process P**47**). The display screen image G**3** displayed with this screen image switching shows the access state the same as that in response to the display screen image G**1** displayed until the screen image switching. As a result, the user is allowed to make operation from the same current operation state before screen image switching.

Going to FIG. **17**, after switching the screen image, the communication terminal **3** detects user's operation in response to the display screen image G**3** acquired by the information processing device **2**. In response detecting, the communication terminal **3** sends the operation information **29** corresponding to the user's operation to the information processing device **2** (process P**50**). With receipt of the operation information **29** in response to the display screen image G**3** from the communication terminal **3**, the information processing device **2** sends the received operation information **29** to the service providing server **4** (process P**51**). In response to receiving the operation information **29**, the service providing server **4** updates the display screen image G**3**, and sends the updated display screen image G**3** to the information processing device **2** (processes P**52** and **53**). After receiving the updated display screen image G**3** from the service providing server **4**, the information processing device **2** again sends the received display screen image G**3** to the communication terminal **3** (process P**54**). Thus, the communication terminal **3** updates the display screen image G**3** for using the cloud service, which is acquired by the information processing device **2** and displayed, to the current state that shows the changes made in response to user's operation (process P**55**).

After the update of the display screen image G**3**, the operation button **47** or **48** to start data upload or download may be pressed on the operation screen image G**2** by the user. The communication terminal **3** then detects the operation as the job execution instruction, and sends a job execution instruction **28***a* to the information processing device **2** (process P**60**). The information processing device **2** starts executing a job in response to the job execution instruction **28***a* (process P**61**). With starting the job, the information processing device **2** transmits and receives data to and from the service providing server **4** (process P**62**). The information processing device **2** establishes direct data communication with the service providing server **4** through the aforementioned first path, thereby uploading or downloading the data.

Detailed sequential procedure of the process performed respectively on the communication terminal **3** and the information processing device **2** is explained next. FIG. **18** is a flow diagram explaining an exemplary sequential procedure

of the process performed on the communication terminal **3**. This exemplary sequential procedure starts upon start up of the remote controlling part **31** on the communication terminal **3**. As starting up on the communication terminal **3**, the remote controlling part **31** sends the connecting request to the information processing device **2** (step S**1**). The information processing device **2** performs user authentication in response to the connecting request. The remote controlling part **31** then determines whether or not the user is successfully authenticated (step S**2**). When the user is not successfully authenticated (when a result of step S**2** is NO), the process by the remote controlling part **31** is complete.

When the user is successfully authenticated (when a result of step S**2** is YES), the remote controlling part **31** performs process in steps S**3** to **15** repeatedly. More specifically, the remote controlling part **31** determines if the operation screen image G**2** for remote operation is received from the information processing device **2** (step S**3**). In response to receiving the operation screen image G**2**, the remote controlling part **31** displays the received operation screen image G**2** on the display unit **15** (step S**4**).

The remote controlling part **31** determines whether or not the cloud service connecting application **30** is running (step S**5**). If the cloud service connecting application **30** is not running (when a result of step S**5** is NO), the process in steps S**6** to S**11** is skipped. If the cloud service connecting application **30** is running (when a result of step S**5** is YES), the remote controlling part **31** determines if the communication path between the information processing device **2** and the service providing server **4** has already been switched from the second path to the first path (step S**6**). If it is determined that the communication path has already been switched to the first path (when a result of step S**6** is YES), the process in steps S**7** to S**9** is skipped. When the communication path is switched yet and the communication path is still the second path (when a result of step S**6** is NO), the remote controlling part **31** performs calculation of both the transmission speed V**1**, the rate of the data communication in the first path, and the transmission speed V**2**, the rate of the data communication in the second path (step S**7**). The remote controlling part **31** then compares the obtained values of transmission speeds V**1** and V**2**, and determines if the transmission speed V**1**, the rate of the data communication in the first path, is faster than the transmission speed V**2** (step S**8**). When the transmission speed V**2**, the rate of the data communication in the second path, is faster (when a result of step S**8** is NO), the process in steps S**9** to S**11** is skipped. When the transmission speed V**1**, the rate of the data communication in the first path, is faster (when a result of step S**8** is YES), the remote controlling part **31** performs communication path switching process (step S**9**). In the communication path switching process (step S**9**), the connecting information for connecting to the cloud service from the information processing device **2** is generated and sent to the information processing device **2**.

The remote controlling part **31** then determines whether or not the display screen image G**3** is received from the information processing device **2** (step S**10**). With the display screen image G**3** received from the information processing device **2**, the remote controlling part **31** performs display process of the display screen image G**3** (step S**11**). The received display screen image may be the display screen image G**3** which has been the first that had ever received since the information processing device **2** automatically logged into the cloud service. In such a case, the remote controlling part **31** switches the display screen image **15***a* for using the cloud service from the display screen image G**1** acquired by the cloud service connecting application **30** to the display screen image G**3** acquired by the information processing device **2**.

The remote controlling part **31** then determines if the user's instruction is detected (step S**12**). With no user's instruction detected (when a result of step S**12** is NO), the process in steps S**13** and S**14** is skipped. With the user's instruction detected (when a result of step S**12** is YES), the remote controlling part **31** generates the operation information corresponds to the operation (step S**13**), and sends the generated operation information to the information processing device **2** (step S**14**).

The remote controlling part **31** determines whether or not operation to complete the remote operation is made by the user, for example (step S**15**). When the operation to complete is not made, the above-explained process is repeatedly performed by returning to step S**3**. When the operation to complete is made by the user, the process by the remote controlling part **31** is complete.

FIGS. **19** and **20** are flow diagrams explaining exemplary sequential procedures of the process performed on the information processing device **2**. This process is started upon the receipt by the information processing device **2** of the connecting request with the short distance radio communication from the communication terminal **3**. This process is mainly performed by the controller **50** of the information processing device **2**. As receiving the connecting request from the communication terminal **3**, the controller **50** performs user authentication in accordance with the user information **25** contained in the received connecting request (step S**20**). When the user authentication results in failure (when a result of step S**21** is NO), the controller **50** completes the process without performing later process. When the user authentication results in success (when a result of step S**21** is YES), the controller **50** performs the process after step S**22**.

When the authentication results in success, the controller **50** creates the operation screen image G**2** for remote operation on the communication terminal **3** (step S**22**), and sends the created operation screen image G**2** to the communication terminal **3** (step S**23**). The controller **50** determines whether or not the calculating instruction of transmission speed is received from the communication terminal **3** (step S**24**). As the calculating instruction is received, the controller **50** calculates the transmission speed V**1**, the rate of direct data communication with the service providing server **4**, in response to the calculating instruction (step S**25**), and sends the obtained value to the communication terminal **3** (step S**26**). With no calculating instruction is received (when a result of step S**24** is NO), the controller **50** skips the process in steps S**25** and S**26**.

The controller **50** determines if the connecting information is received from the communication terminal **3** (step S**27**). In response to receiving the connecting information, the controller **50** connects to the service providing server **4** over the network **5** in accordance with the received connecting information, and automatically logs into the user-specific account (step S**28**). The controller **50** acquires the display screen image G**3** for using the cloud service from the service providing server **4** (step S**29**), and sends the acquired display screen image G**3** to the communication terminal **3** (step S**30**). If no connecting information is received, the controller **50** skips the process in steps S**28** to S**30**.

The controller **50** then determines whether or not the operation information is received from the communication terminal **3** (step S**31**). As receiving the operation information, the controller **50** performs operation information receiving process (step S**32**).

FIG. **20** is a flow diagram explaining the detailed exemplary sequential procedure of the operation information receiving process (step S**32**). As shown in FIG. **20**, upon the start of the process, the controller **50** determines if the received operation information is the one corresponding to the operation made in response to the operation screen image G**2** (step S**40**). When the received operation information is not the one corresponding to the operation made in response to the operation screen image G**2** (when a result of step S**40** is NO), the controller **50** sends the operation information to the service providing server **4** (step S**41**). The controller **50** then acquires the display screen image G**3** updated based on the operation information from the service providing server **4** (step S**42**), and sends the display screen image G**3** to the communication terminal **3** (step S**43**). The controller **50** moves on to the process in step S**48**.

When the received operation information is the one corresponding to the operation made in response to the operation screen image G**2** (when a result of step S**40** is YES), the controller **50** analyzes the received operation information, thereby determining whether or not the user's instruction is to specify data transmission and receipt to and from the service providing server **4** (step S**44**). If the operation is not to specify data transmission and receipt to and from the service providing server **4** (when a result of step S**44** is NO), the controller **50** moves on to the process in step S**48**.

If the operation is to specify data transmission and receipt to and from the service providing server **4** (when a result of step S**44** is YES), the controller **50** determines if it is connecting to the cloud service of the service providing server **4** (step S**45**). When it is connecting to the cloud service (when a result of step S**45** is YES), the controller **50** establishes direct data communication with the service providing server **4**, thereby uploading or downloading the data specified by the user (step S**46**). When it is not connecting to the cloud service (when a result of step S**45** is NO), the controller **50** establishes indirect data communication with the service providing server **4** via the communication terminal **3**, thereby uploading or downloading the data specified by the user (step S**47**). The controller **50** then moves on to the process in step S**48**.

The controller **50** determines whether or not update of the operation screen image G**2** is required (step S**48**). If the update is required (when a result of step S**48** is YES), the controller **50** updates the operation screen image G**2** in accordance with the operation information (step S**49**), and sends the updated operation screen image G**2** to the communication terminal **3** (step S**50**). With the operation information receiving process as described above, the screen image displayed with the communication terminal **3** is properly updated every time the user makes operation.

Referring back to the flow diagram of FIG. **19**, the controller **50** does not perform the above-described operation information receiving process (step S**32**) when no operation information is received from the communication terminal **3**. In this case, the controller **50** determines whether or not to terminate the remote connection with the short distance radio communication with the communication terminal **3** (step S**33**). If not terminating the remote connection, the controller **50** repeatedly performs the aforementioned process by returning to step S**24**. If terminating the remote connection, the process by the controller **50** is complete.

With the above-described process performed respectively on the communication terminal **3** and the information processing device **2**, the user is allowed to use the information processing device **2** by remote control on the communication terminal **3**. The remote controlling part **31** may be started up as the user uses the cloud service on the communication terminal **3**. In such a case, both of the display screen image **15***a* for using the cloud service and the operation screen image **15***b* for remotely operating the information processing device **2** are displayed on the display unit **15**. Thus, operation to upload the data to the cloud service or to download the data from the cloud service may be performed efficiently.

When the cloud service connecting application **30** and the remote controlling part **31** are brought into operation at the same time on the communication terminal **3**, the remote controlling part **31** selects the faster path through which the data transmission and receipt between the information processing device **2** and the service providing server **4** at a faster rate is allowed. To be more specific, when it is more efficient to establish direct data communication between the information processing device **2** and the service providing server **4**, the remote controlling part **31** switches the communication path between the information processing device **2** and the service providing server **4** to the first path through which direct data communication between the information processing device **2** and the service providing server **4** with each other is established. As a result, efficient data communication for data upload to the cloud service from the information processing device **2** or data download from the cloud service to the information processing device **2** may be realized.

In response the communication path switching, the communication terminal **3** automatically switches the display screen image **15***a* for using the cloud service from the display screen image G**1** acquired by the cloud service connecting application **30** to the display screen image G**3** acquired by the information processing device **2**. The communication terminal **3** then sends the user's instruction made in response to the display screen image **15***a* to the information processing device **2**. With this screen switching, the display screen image G**1** acquired by the cloud service connecting application **30** is no longer displayed on the display unit **15**. The user, therefore, does not have to care of the screen switching, and he or she is allowed to select a folder or a file properly.

As described above, the communication terminal **3** of the present preferred embodiment includes the remote controlling part **31** that acquires the operation screen image required for the user to perform remote operation of the information processing device **2** from the information processing device **2** through communication with the information processing device **2** and displays the acquired operation screen image on the display unit **15** in response to the user's instruction. The communication terminal **3** of the present preferred embodiment also includes the cloud service connecting application **30** that connects to the service providing server **4** providing the cloud service over the network **5** to acquire the display screen image G**1** for using the cloud service from the service providing server **4** and displays the acquired display screen image G**1** on the display unit **15** in response to the user's instruction. The remote controlling part **31** sends the connecting information for connecting to the service providing server **4** to the information processing device **2** as the cloud service connecting application **30** is connecting to the service providing server **4**, and receives the display screen image G**3** which is acquired by the information processing device **2** from the service providing server **4**. In response to receiving the display screen image G**3**, the remote controlling part **31** switches the display screen image G**1** displayed by the cloud service connecting application **30** on the display unit **15** to the display screen image G**3** which is acquired by the information processing device **2** from the service providing server **4**. The remote controlling part **31** then sends the user's instruction made in response to the display screen image G**3** to the information processing device **2**.

With the remote controlling part **31** and the cloud service connecting application **30**, the operability for data communication between the information processing device **2** and the service providing server **4** providing the cloud service may be improved. More in detail, the communication terminal **3** sends the connecting information for connecting to the service providing server **4** to the information processing device **2** so that the user is allowed to save time for entering the connecting information to the information processing device **2**. Moreover, the display screen image G**1** displayed by the cloud service connecting application **30** on the display unit **15** may be automatically switched to the display screen image G**3** which is acquired by the information processing device **2** from the service providing server **4**. As a result, the user is only required to make operation in response to the same display screen image before and after the screen switching, and the operating confusion may be avoided. The user is allowed to make operation efficiently. For the screen switching, the display screen image G**3** after the screen switching shows the access state of the user before the screen switching as described above. This results in greater improvement of operability.

As the cloud service connecting application **30** connects to the service providing server **4**, the remote controlling part **31** of the present preferred embodiment obtains values of the transmission speed V**1**, the rate of direct data communication between the information processing device **2** and the service providing server **4**, and the transmission speed V**2**, the rate of the data communication between the information processing device **2** and the service providing server **4** via the communication terminal **3**, and compares the obtained values. When the transmission speed V**1** is faster, the remote controlling part **31** sends the connecting information to the information processing device **2**. More specifically, when the transmission speed V**2**, the rate of the data communication between the information processing device **2** and the service providing server **4** via the communication terminal **3**, is faster than the transmission speed V**1**, the connecting information is not sent to the information processing device **2**, and the data is transmitted and received indirectly between the information processing device **2** and the service providing server **4** via the communication terminal **3**. According to the present preferred embodiment, data communication may be established between the information processing device **2** and the service providing server **4** through the path that realizes efficient communication.

The communication terminal **3** repeatedly performs the process to obtain the values of the transmission speeds V**1** and V**2** and compare the values on a regular basis. As a result, the communication path may be switched to the one that realizes more efficient data communication in real time even when any problem such as a network trouble is occurred, for example.

The connecting information sent from the communication terminal **3** to the information processing device **2** contains the destination address **23** for access to the service providing server **4** over the network **5** and the authentication information **24** for logging into the service providing server **4**. The information processing device **2** thereby received the connecting information from the communication terminal **3** starts the network connection by referring to the connecting information, thereby automatically connecting to the service providing server **4** and automatically logging into the user-specific account.

In the present preferred embodiment, the display screen image **15***a* is switched by the remote controlling part **31**. In response to switching, the display screen image G**3** to which the image **46** indicating that the screen image is acquired by the information processing device **2** from the service providing server **4** is attached on the display unit **15** of the communication terminal **3**. The user is, therefore, allowed to know that the display screen image G**3** displayed on the display unit **15** is acquired by the information processing device **2**.

As described above, the operability of data communication between the information processing device and the service providing server providing the cloud service may be improved. Moreover, the user is allowed to transmit and receive data efficiently with operating the communication terminal.

MODIFICATIONS

While the preferred embodiment of the present invention has been described above, the present invention is not limited to the preferred embodiment. Various modifications may be applied to the present invention.

In the present preferred embodiment described above, the information processing device **2** is shown to be one of MFPs with multiple functions such as scan function, print function and box function, for example. The information processing device of the present invention is not necessarily the device such as the MFPs including multiple functions. To be more specific, the information processing device of the present invention may be a device with single function such as devices including a specialized scan device with a function to send image data generated by reading a document to outside over the network **5**, or a specialized fax device with a function to produce a printed output based on the image data received from the outside over the network **5**. Alternatively, the information processing device may be a network storage connected to a network such as LAN in the office.

In the above-described present preferred embodiment, the communication terminal **3** and the information processing device **2** establish short distance radio communication such as NFC (Near Field Communication). It is not limited to the short distance radio communication. More specifically, the user terminal **3** and the information processing device **2** may establish communication over the network such as LAN.

In the above-described present preferred embodiment, values of the transmission speed V**1**, the rate of direct data communication between the information processing device **2** and the service providing server **4**, and the transmission speed V**2**, the rate of data communication between the information processing device **2** and the service providing server **4** via the communication terminal **3**, are obtained and compared. When the transmission speed V**1** is faster, the communication terminal **3** establishes connection that enables direct data communication between the information processing device **2** and the service providing server **4**. It, however, is not limited to the case where the transmission speed V**1** is faster. The connection that enables direct data communication between the information processing device **2** and the service providing server **4** may be established when both the cloud service connecting application **30** and the remote controlling part **31** are brought into operation at the same time.

The communication terminal **3** is not limited to the device such as the tablet terminal or the smart phone. The communication terminal **3** may be formed from a computer such as a generally-used personal computer (PC).

What is claimed is:

1. An information processing system comprising a communication terminal and an information processing device that allow communication therebetween, wherein

said communication terminal includes:

a display part on which a variety of information is displayed to a user; and

a communication terminal controller configured to:

acquire an operation screen image, with which the user makes remote operation of said information processing device, by establishing communication with said information processing device in response to user's instruction, and cause the acquired operation screen image to be displayed on said display part,

connect to a service providing server providing a cloud service over a network, and acquire a display screen image for using said cloud service from said service providing server in response to user's instruction, thereby causing the acquired display screen image to be displayed on said display part together with the operation screen image displayed, and

send connecting information for connecting to said service providing server to said information processing device as said communication terminal controller is connecting to said service providing server,

said information processing device includes an information processing device controller configured to:

connect to said service providing server over the network, establish communication with said service providing server in accordance with said connecting information received from said communication terminal, and acquire a second display screen image for using said cloud service from said service providing server in response to user's instruction; and

send the second display screen image acquired from said service providing server to said communication terminal, wherein

said communication terminal controller is further configured to switch the display screen image displayed by said communication terminal controller on said display part to the second display screen image acquired by said information processing device from said service providing server when receiving the display screen image acquired from said service providing server by said information processing device, and send user's instruction given to the switched second display screen image to said information processing device.

2. The information processing system according to claim **1**, wherein

said communication terminal controller is configured to, as said communication terminal controller connects to said service providing server, obtain values of a transmission speed of direct data communication between said information processing device and said service providing server and a transmission speed of data communication between said information processing device and said service providing server via said communication terminal to compare the obtained values, and send said connecting information to said information processing device when the former transmission speed is faster.

3. The information processing system according to claim **1**, wherein

said information processing device controller is further configured to directly transmit and receive data to and from said service providing server to execute a job without connecting via said communication terminal when an instruction on data transmission and receipt to and from said service providing server is received from said communication terminal as said information processing device controller is connecting to said service providing server.

4. The information processing system according to claim **1**, wherein

said connecting information contains an address required for an access to said service providing server over the network and authentication information required for log-in to said service providing server.

5. The information processing system according to claim **1**, wherein

said communication terminal controller is configured to send access state information indicating access state where said service providing server is accessed by said communication terminal controller to said information processing device while sending said connecting information to said information processing device.

6. The information processing system according to claim **1**, wherein

with display screen image switching by said communication terminal controller, said display part displays the second display screen image and attaches an image indicating that the screen image is acquired by said information processing device from said service providing server.

7. A communication terminal capable of establishing communication with an information processing device to and from which data is transmitted and received, comprising:

a display part on which a variety of information is displayed to a user; and

a controller configured to:

acquire an operation screen image, with which the user makes remote operation of said information processing device, by establishing communication with said information processing device in response to user's instruction, and cause the acquired operation screen image to be displayed on said display part,

connect to a service providing server providing a cloud service over a network, and acquire a display screen image for using said cloud service from said service providing server in response to user's instruction, thereby causing the acquired display screen image to be displayed on said display part together with the operation screen image displayed, and

send, as said controller is connecting to said service providing server, sends connecting information for connecting to said service providing server to said information processing device to cause said information processing device to establish communication with said service providing server, thereby acquiring a second display screen image for using said cloud service from said information processing device to switch the display screen image displayed on said display part to the second display screen image acquired by said information processing device from said service providing server, and send user's instruction given to the switched second display screen image to said information processing device.

8. The communication terminal according to claim **7**, wherein

said controller is configured to, as said controller is connecting to said service providing server, obtain values of a transmission speed of direct data communication between said information processing device and said service providing server and a transmission speed of data communication between said information processing device and said service providing server via said communication terminal to compare the obtained val-

ues, and send said connecting information to said information processing device when the former transmission speed is faster.

9. The communication terminal according to claim **7**, wherein

said connecting information contains an address required for an access to said service providing server over the network and authentication information required for log-in to said service providing server.

10. The communication terminal according to claim **7**, wherein

said controller is configured to send access state information indicating access state where said service providing server is accessed by said controller to said information processing device while sending said connecting information to said information processing device.

11. The communication terminal according to claim **7**, wherein

said controller is configured to cause said information processing device to directly transmit and receive data to and from said service providing server without connecting via said communication terminal when an instruction on data transmission and receipt between said information processing device and said service providing server is given by the user with the second display screen image acquired by said information processing device being displayed, to which the display screen image on said display unit is switched by said controller after acquiring the second display screen image for using said cloud service from said information processing device.

12. An information processing device capable of establishing communication with a communication terminal, said communication terminal being connected to a service providing server providing a cloud service, comprising a controller configured to:

connect to said service providing server over a network, establish communication with said service providing server in accordance with connecting information, said connecting information being received from said communication terminal as said communication terminal is connecting to said service providing server, and acquire a display screen image for using said cloud service from said service providing server in response to user's instruction;

create an operation screen image for remote operation of the information processing device by said communication terminal and send the operation screen image to said communication terminal, and send the display screen image acquired by said controller from said service providing server to said communication terminal by establishing communication with said communication terminal; and

transmit and receive data to and from said service providing server through said controller to execute a job without connecting via said communication terminal when an instruction on data transmission and receipt to and from said service providing server is received from said communication terminal as said controller is connecting to said service providing server.

13. The information processing device according to claim **12**, wherein

said controller is configured to automatically log into said service providing server based on authentication information, which is contained in said received connecting information, while connecting to said service providing server.

14. The information processing device according to claim **12**, wherein

said controller is configured to connect to said service providing server based on access state information received together with said connecting information from said communication terminal while connecting to said service providing server, thereby connecting to said service providing server with maintaining access state the same as a state where said communication terminal is accessing said service providing server.

15. The information processing device according to claim **12**, wherein

said controller is configured to attach an image indicating that the screen image is acquired by said information processing device from said service providing server to the display screen image acquired by said controller from said service providing server while sending the display screen image to said communication terminal.

16. A non-transitory computer readable recording medium on which a program is recorded, said program executable on a communication terminal capable of connecting to a service providing server providing a cloud service by running an application, said program causing said communication terminal to establish communication with an information processing device, to and from which data is transmitted and received, thereby remotely controlling said information processing device, said program executed on said communication terminal to function as a system comprising:

a screen image controlling part for acquiring an operation screen image, with which a user makes remote operation of said information processing device, by establishing communication with said information processing device, and causing the acquired operation screen image to be displayed on a predetermined display part;

a connection detecting part for detecting that said application is connecting to said service providing server; and

a communication path switching part for sending connecting information for connecting to said service providing server to said information processing device, and causing said information processing device to establish communication with said service providing server as said application is connecting to said service providing server, wherein

said screen image controlling part, as said information processing device starts communication with said service providing server in response to sending said connecting information to said information processing device by said communication path switching part, acquires a second display screen image for using said cloud service from said information processing device to switch a first display screen image for using said cloud service, which is displayed on said display part by said application, to the second display screen image acquired from said information processing device, and sends user's instruction given to the switched second display screen image to said information processing device.

17. The non-transitory computer readable recording medium according to claim **16**, said program executed on said communication terminal to function as the system further comprising:

a transmission speed determining part for obtaining values of a transmission speed of direct data communication between said information processing device and said service providing server and a transmission speed of data communication between said information processing device and said service providing server via said communication terminal to compare the obtained values

as said application is running on said communication terminal and connecting to said service providing server, wherein

said communication path switching part is caused to send said connecting information to said information processing device only if said transmission speed determining part determines that the transmission speed of direct data communication between said information processing device and said service providing server is faster than the transmission speed of data communication between said information processing device and said service providing server via said communication terminal.

18. The non-transitory computer readable recording medium according to claim **16**, wherein

said communication path switching part sends said connecting information to said information processing device, containing an address required for an access to said service providing server over a network and authentication information required for log-in to said service providing server.

19. The non-transitory computer readable recording medium according to claim **16**, wherein

said communication path switching part sends access state information indicating access state where said service providing server is accessed by said application to said information processing device while sending said connecting information to said information processing device.

20. The non-transitory computer readable recording medium according to claim **16**, wherein

said screen image controlling part causes said information processing device to directly transmit and receive data to and from said service providing server without connecting via said communication terminal when an instruction on data transmission and receipt between said information processing device and said service providing server is given by a user with the second display screen image acquired from said information processing device being displayed, to which the display screen image on said display unit is switched by said application after acquiring the second display screen image for using said cloud service from said information processing device.

21. The information processing system according to claim **1**, wherein said information processing device controller is configured to:

determine an operation status on each screen image as the operation screen image, with which the user makes remote operation of said information processing device, and the second display screen image received from said information processing device and switched by said communication terminal controller are both displayed on said display part of said communication terminal, thereby determining whether or not data processing is allowed, and

send a process start button image to said communication terminal when determining the data processing is allowed; and

said communication terminal controller is configured to:

cause said process start button image received from said information processing device to be displayed on said display part, and

cause a start instruction to start the data processing to be sent to said information processing device when said displayed process start button is pressed.

22. The information processing system according to claim **21**, wherein said information processing device controller is configured to:

determine whether a predetermined file is selected on the operation screen image for remote operation,

determine that upload of a predetermined file to said service providing server is allowed when the information processing device controller determines the predetermined file is selected on the operation screen image for remote operation, and

send, to said communication terminal, said process start button image to start upload of the predetermined file to said service providing server.

23. The information processing system according to claim **21**, wherein said information processing device controller is configured to:

determine whether a predetermined file is selected on the switched second display screen image,

determine whether a predetermined storage part is selected on the operation screen image for remote operation,

determine that download of the predetermined file from said service providing server to the predetermined storage part is allowed when the information processing device controller determines that the predetermined file is selected on the switched second display screen image and the predetermined storage part is selected on the operation screen image for remote operation, and

send, to said communication terminal, said process start button image to start download of the file from said service providing server to said predetermined storage part.

24. The communication terminal according to claim **7**, wherein said controller is configured to:

acquire a process start button image to start the data processing from said information processing device as the operation screen image, with which the user makes remote operation of said information processing device, and the second display screen image received from said information processing device and switched by said communication terminal controller are both displayed on said display part,

cause said process start button image acquired from said information processing device to be displayed on said display part, and

send a start instruction to start the data processing to said information processing device when said displayed process start button image is pressed.

25. The communication terminal according to claim **24**, wherein said controller is configured to:

acquire said process start button image to start upload of a predetermined file to said service providing server from said information processing device when the predetermined file is selected on the operation screen image for remote operation.

26. The communication terminal according to claim **24**, wherein said controller is configured to:

acquire said process start button image to start download of a predetermined file from said service providing server to a predetermined storage part from said information processing device when the predetermined file is selected on the switched second display screen image and the predetermined storage part is selected on the operation screen image for remote operation.

27. The information processing device according to claim **12**, wherein said controller is configured to:

determine an operation status on each screen image as the operation screen image, with which the user makes remote operation of said information processing device, and the second display screen image received from said information processing device and switched by said

communication terminal controller are both displayed on said display part of said communication terminal, thereby determining whether or not data processing is allowed,

send a process start button image to start the data processing to said communication terminal when determining the data processing is allowed, and

receive a start instruction to start the data processing from said communication terminal when said process start button image is pressed.

28. The information processing device according to claim **27**, wherein said controller is configured to:

determine whether a predetermined file is selected on the operation screen image for remote operation,

determine that upload of the predetermined file to said service providing server is allowed when the controller determines the predetermined file is selected on the operation screen image for remote operation, and

send, to said communication terminal, said process start button image to start upload of the predetermined file to said service providing server.

29. The information processing device according to claim **27**, wherein said controller is configured to:

determine whether a predetermined file is selected on the switched second display screen image,

determine whether a predetermined storage part is selected on the operation screen image for remote operation,

determine that download of the predetermined file from said service providing server to the predetermined storage part is allowed when the information processing device controller determines that the predetermined file is selected on the switched second display screen image and the predetermined storage part is selected on the operation screen image for remote operation, and

send, to said communication terminal, said process start button image to start download of the file from said service providing server to said predetermined storage part.

30. The non-transitory computer readable recording medium according to claim **16**, wherein said screen image controlling part

acquires a process start button image to start the data processing from said information processing device as the operation screen image, with which the user makes remote operation of said information processing device, and the second display screen image received from said information processing device and switched by said screen image controlling part are both displayed on said display part,

causes said process start button image acquired from said information processing device to be displayed on said display part, and

sends a start instruction to start the data processing to said information processing device when said displayed process start button image is pressed.

31. The non-transitory computer readable recording medium according to claim **30**, wherein said screen image controlling part acquires said process start button image to start upload of a predetermined file to said service providing server from said information processing device when the predetermined file is selected on the operation screen image for remote operation.

32. The non-transitory computer readable recording medium according to claim **30**, wherein said screen image controlling part acquires said process start button image to start download of a predetermined file from said service providing server to a predetermined storage part from said information processing device when the predetermined file is selected on the switched second display screen image and the predetermined storage part is selected on the operation screen image for remote operation.

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